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1911

STATE HORTICULTURAL

ASSOCIATION
OF
PENNSYLVANIA

PROCEEDINGS

1911 -1915

PROCEEDINGS

of the

Fifty-second Annual Meeting

of the

State Horticultural
Association

of Pennsylvania

Held in

Harrisburg, Pa., January 24, 25, 26, 1911

State Horticultural Association of Pennsylvania Officers for 1911

PRESIDENT.

Gabriel Hiester, Harrisburg.

VICE-PRESIDENTS.

Hon. Wm. T. Creasy, Catawissa;

Robert M. Eldon, Aspers;

F. H. Fassett, Meshoppen.

SECRETARY.

Chester J. Tyson, Flora Dale.

TREASURER.

Edwin W. Thomas, King of Prussia.

VICE PRESIDENTS FROM COUNTY ASSOCIATIONS. (Presidents of County Associations for current year.)

Adams, Robert M. Eldon; *Bedford*, A. C. Richards; *Eric*, Geo. W. Blaine;
Luzerne, W. J. Lewis; *Perry*, Wm. Stewart; *Somerset*, D. B. Zimmermann.
Several Counties not heard from in time to print.

EXECUTIVE BOARD.

All the above named officers.

COMMITTEES IN CHARGE OF 1911 MEETING.

Committee of Arrangements.

E. B. Engle, Harrisburg; L. M. Myers, Siddonsburg; H. H. Snively, Willow Street; C. A. Wolfe, Aspers; J. L. Rife, Camp Hill.

Reception Committee.

R. J. Walton, Hummelstown; Dr. I. H. Mayer, Willow Street; H. C. Snively, Cleona; J. D. Herr, Harrisburg; W. H. Stout, Pine Grove.
Revision of Constitution, to Confer with Executive Committee.
Edwin C. Tyson, Flora Dale; W. J. Lewis, Pittston; A. D. Strode, West Chester.

In Charge of Exhibits.

W. J. Wright, Chairman, State College;
E. P. Garrettson, Biglerville; P. S. Fenstermacher, Allentown; H. C. Baker, Tunkhannock; A. C. Richards, Schellsburg; Abram Hostetler, Johnstown; Ross F. Lee, Somerset; Calvin P. Scholl, Halifax; James A. Patterson, Stewartstown.

STANDING COMMITTEES FOR 1911.

Legislative Committee.

William T. Creasy, Catawissa; Howard G. McGowan, Geigers Mills;
Levi M. Myers, Siddonsburg.

Exhibition Committee.

Prof. W. J. Wright, Chairman, State College.
Ward C. Pelton, North Girard; Chas. A. Wolfe, Aspers;
John B. McClelland, Canonsburg; R. H. Garrahan, Kingston.

General Fruit Committee.

John D. Herr, Chairman, Harrisburg.
Membership in this Committee is composed of one member from each County represented in the Association. Other members have assisted with the reports in some of the more important fruit counties, three or four taking part in the work.

Membership and Expansion Committee.

One member from each County in the State showing horticultural activity.

MEMBERSHIP

Life Members

NAME.	POST OFFICE.	COUNTY.
Anderson, H. W.,	Stewartstown,	York.
Atwater, Richard M.,	Chadds Ford,	Chester.
Barlow, Thos. W.,	Fort Washington,	Montgomery.
Boltz, Peter R.,	Lebanon,	Lebanon.
Boyer, John F.,	Middleburg,	Snyder.
Blaine, Geo. W.,	North East,	Erie.
Brinton, William P.,	Christiana,	Lancaster.
Chase, Chas. T.,	Devon,	Chester.
Chase, Howard A.,	Union League,	Philadelphia.
Creasy Hon. William T.,	Catawissa,	Columbia.
Crouse, E. A.,	Gettysburg,	Adams.
Cummings, Jos. F.,	Sunbury,	Northumberland.
Dill, Robert,	North East,	Erie.
Eldon, Robert M.,	Aspers,	Adams.
Engle, Enos B.,	Harrisburg,	Dauphin.
Engle, John G.,	Marietta,	Lancaster.
Fox, Cyrus T.,	Harrisburg,	Dauphin.
Garrettson, Joel V.,	Aspers,	Adams.
Good, C. W.,	Waynesboro,	Franklin.
Grove, W. E.,	York Springs,	Adams.
Haddock, John C.,	Wilkes-Barre,	Luzerne.
Hartman, D. L.,	Little River, Florida	
Hartman, Geo. R.,	Biglerville,	Adams.
Hartman, L. E.,	Etters,	York.
Heard, R. E.,	Buffalo, New York	
Hiester, Gabriel,	Harrisburg,	Dauphin.
Hoopes, Abner,	West Chester,	Chester.
Hostetler, Abram,	Johnstown,	Cambria.
Huff, L. B.,	Greensburg,	Westmoreland.
Huff, Burrell R.,	Greensburg,	Westmoreland.
Hull, D. W.,	Waymart,	Wayne.
Jones, S. Morris,	West Grove,	Chester.
Keller, H. M.,	Gettysburg, Route 5,	Adams.
Landis Israel,	Lancaster,	Lancaster.
Loop, A. L.,	North East,	Erie.
Martin, J. O.,	Mercersburg,	Franklin.
McCormick, James,	Harrisburg,	Dauphin.
McFarland, J. Horace,	Harrisburg,	Dauphin.
McLanahan, I. King,	Hollidaysburg,	Blair.
Meehan, S. Mendelson,	Germantown,	Philadelphia.
Mitchell, Ehrman B.,	Harrisburg,	Dauphin.
Myers, Levi M.,	Siddonsburg,	York.
O'Connor, Haldeman,	13 N. Front St., Harrisburg,	Dauphin.
Pannebaker, Wm. M.,	Virgilina, Virginia	
Reist, John G.,	Mt Joy,	Lancaster.
Rick, John,	Reading,	Berks.
Satterthwaite, Fred'k. G.,	Fallsington,	Bucks.
Scribner, Prof. F. Lamson,	Knoxville, Tenn.,	
Shaffner, Jacob,	Harrisburg,	Dauphin.
Sharpe, Miss E. M.,	Accotink, Virginia	
Snively, H. H.,	Willow Street,	Lancaster.
Stem, Dr. J. C.,	Lemovne,	Cumberland.
Thomas Edwin W.,	King of Prussia,	Montgomery.
Tyson, Chester J.,	Flora Dale,	Adams.
Tyson, Edwin C.,	Flora Dale,	Adams.
Tyson, Wm. C.,	Guernsey,	Adams.
Van Deman, H. E.,	3630 13 St., N.W., Washington, D.C.	
Wertz, D. Maurice,	Waynesboro,	Franklin.
Wertz, George M.,	Johnstown,	Cambria.
Woods, Edw., A.,	Frick Building, Pittsburg,	Allegheny.
Youngs, L. G.,	North East,	Erie.

Annual Members for 1911

A.

NAME.	POST OFFICE.	COUNTY.
Adams, R. M.,	Lancaster,	Lancaster.
Adams, W. S.,	Aspers,	Adams.
Allen, Carl G.,	Williamsport,	Lycoming.
Allen, W. C.,	Tunkhannock, Route 3,	Wyoming.
Anderson, Jos. W.,	Stewartstown,	York.
Anderson, H. M.,	New Park,	York.
Andrews, J. B.,	Roanoke, Virginia	
Anwyll, Harry L.,	Harrisburg,	Dauphin.
Arny, J. J.,	Centre Hall,	Centre.
Arny, L. Wayne,	New Britain,	Bucks.
Ashenfelter, Horace,	Royersford,	Montgomery.
Atba, S. H.,	Beaver,	Beaver.
Atwater, C. G.,	17 Battery Place, New York, N. Y.,	

B.

Bailey, J. I.,	Baker Summit,	Bedford.
Baird, A. T.,	Island,	Clinton.
Baird, Wm. H.,	Center Hall,	Centre.
Baker, H. C.,	Tunkhannock,	Wyoming.
Banks, William,	Mifflintown,	Juniata.
Banks, M. H.,	Siddonsburg,	York.
Banzhaf, W. H.,	Muncy,	Lycoming.
Barclay, R. D.,	424 S 40th St., Philadelphia,	Philadelphia.
Barnard, C. P.,	North Brook,	Chester.
Barnes, Wade H.,	Brooklyn,	Susquehanna.
Barnhart, Albert,	Annville,	Lebanon.
Bartram, Geo. H.,	West Chester, Route 5,	Chester.
Baughner, H. G.,	Aspers,	Adams.
Baughman, F. E.,	Manor,	Westmoreland.
Beachy, N. C.,	Allentown,	Lehigh.
Behrhorst, C. E.,	613 Orchard St., Avalon,	Allegheny.
Bell, Robert Harry,	State College,	Centre.
Bell, James A.,	Canonsburg, Route 4,	Washington.
Belt, J. E.,	Wellsville,	York.
Bender, E. P.,	Carrolltown,	Cambria.
Benn, M. L.,	Coudersport,	Potter.
Bergey, James,	Mifflintown,	Juniata.
Berner, Ralph, A.,	Tamaqua,	Schuylkill.
Bertolet, Israel M.,	Oley,	Berks.
Black, William H.,	Flora Dale,	Adams.
Blessing, David S.,	4 N. Court St., Harrisburg,	Dauphin.
Blythe, F. H.,	State College,	Centre.
Boland, Thomas E.,	Swarthmore,	Delaware.
Bolton, William P.,	McCall Ferry,	Lancaster.
Bostwick, D. C., and Son,	North East,	Erie.
Bourne, J.,	North East,	Erie.
Bowen, E. T.,	Springbrook,	Lackawanna.
Bower, A. D.,	Linglestown,	Dauphin.
Bowers, E. C.,	East Petersburg,	Lancaster.
Boyd, J. C.,	Guys Mills,	Crawford.
Boyer, W. W.,	Arendtsville,	Adams.
Brashear, Walter,	West Fairview,	Cumberland.
Bream, H. J.,	Aspers,	Adams.
Bream, Samuel,	Biglerville,	Adams.
Brenneman, J. W.,	Willow Street,	Lancaster.
Briggs, J. S.,	Norristown,	Montgomery.
Brinton, S. L.,	West Chester,	Chester.
Brinton, William,	Timicula,	Chester.
Brodbeck, A. R.,	Hanover,	York.
Brooke, R. G.,	Schwenksville,	Montgomery.
Brown, M. B.,	North East,	Erie.
Brownback, Jesse Taylor,	West Chester, Route 6,	Chester.
Brunges, Hon. Stanley,	Tunkhannock,	Wyoming.
Brunges, Howard P.,	Tunkhannock,	Wyoming.

NAME.	POST OFFICE.	COUNTY.
Bucher, Dr. I. Reily,	Lebanon,	Lebanon.
Buckwalter, J. T.,	Lancaster,	Lancaster.
Buckwalter, Harry,	Norristown, R. D.,	Montgomery.
Buckwalter, Silas K.,	Lancaster, Route 8,	Lancaster.
Bullock, W. H.,	Honesdale, Route 3,	Wayne.
Burgess, Nelson W.,	Wyoming,	Luzerne.
Burke, Paul H.,	Reading,	Berks.
Bullers, A. J.,	Brookville, Route 6,	Jefferson.
Butt, G. Will,	North East,	Erie.

C.

Campbell, W. J.,	Honey Grove,	Juniata.
Canfield, H. A.,	19 Potter St., Bradford,	McKean.
Card, Fred W.,	Sylvania,	Bradford.
Carpenter, C. J., Jr.,	50 Church St., New York, N. Y.,	Elk.
Cassels, Frank,	Kersey,	Elk.
Catchpole, Geo. C.,	North Rose, N. Y.,	Berks.
Chambers, Alfred H.,	938 Pear St., Reading,	Berks.
Chandler, W. H.,	Scranton,	Lackawanna.
Chandler, W. H., Jr.,	Scranton,	Lackawanna.
Chapin, Irvin,	Shickshinny,	Luzerne.
Christman, F.,	Sellersville,	Bucks.
Christman, J. M.,	Fort Hunter,	Dauphin.
Claar, William,	Queen,	Bedford.
Clark, R. S.,	Dillsburg,	York.
Clegg, William S.,	New Bloomfield,	Perry.
Clemson, J. W.,	Halifax,	Dauphin.
Clouse, W. H.,	414 Shaw Ave., McKeesport,	Allegheny.
Clouser, S. L.,	Inglenook,	Dauphin.
Clovis, A. E.,	Jollytown,	Greene.
Cochran, J. W.,	Canonsburg, Route 5,	Washington.
Cocklin, B. F.,	Mechanicsburg, No. 2,	Cumberland.
Cocklin, E. H.,	Siddonsburg,	York.
Cocklin, J. A.,	Siddonsburg,	York.
Collins, S. C.,	Bainbridge,	Lancaster.
Conley, H. D.,	Etters, Route 2,	York.
Coray, W. H.,	Pittston, Route 1,	Luzerne.
Corson, H. H.,	Avondale,	Chester.
Coursen, I. H.,	Wyoming,	Luzerne.
Couse, Norman W.,	North East,	Erie.
Cox, J. W.,	New Wilmington,	Lawrence.
Crawford Bros.,	North East,	Erie.
Crawford, J. B.,	Fayetteville,	Franklin.
Critchfield, Hon. N. B., . . .	Harrisburg,	Dauphin.
Croyle, Robert,	Johnstown, Route 4,	Cambria.
Cumblor, H. B.,	Logania,	Perry.
Curstead, N. B.,	Olipphant Furnace,	Fayette.

D.

Davenport, Eugene,	578 W. Main St., Plymouth,	Luzerne.
Davenport, Geo. F.,	578 W. Main St., Plymouth,	Luzerne.
Davis, Wm. H. H.,	West Chester, Route 7,	Chester.
Davison, C. M.,	Chambersburg,	Franklin.
Deardorff, T. A.,	Cashtown,	Adams.
Deming, Co.,	Salem, Ohio,	Dauphin.
Demming, H. C.,	Harrisburg,	Dauphin.
Denehey, W. R.,	1423 N. Front St., Harrisburg,	Lancaster.
Denlinger, Amos B.,	Strasburg, Route 1,	Mifflin.
Detweiler, D. Z.,	Belleville,	Chester.
Detwiler, William P.,	Phoenixville,	Wyoming.
Dewitt, J. A.,	Falls,	Northumberland.
DeWitt, H. L.,	Riverside,	Lehigh.
Dickenshied, Fred S.,	Zionsville,	Lackawanna.
Dickson, Mrs. Jas. P.,	Dalton,	Luzerne.
Diggory, R. J.,	300 Walnut St., Kingston,	Chester.
Downing, Lewis R.,	Downingtown,	Chester.
Dulles, John W.,	West Chester,	Chester.

NAME.	POST OFFICE.	COUNTY.
Duncan, P. F.,	Duncannon,	Perry.
Dunlap, R. Bruce,	State College,	Centre.
Durell, Chas. A.,	Reading,	Berks.
Dusman, W. F.,	Hanover,	York.

E.

Eastman, Jas. E.,	Rome,	Bradford.
Ebert, Carl,	Holmsburg,	Philadelphia.
Edmonds, J. R.,	Hagerstown, Md.,	Franklin.
Eicholz, Henry,	Waynesboro,	Franklin.
Elder, Irvin C.,	Chambersburg,	Montgomery.
Ellis, David M.,	Bridgeport,	Erie.
Ellsworth, J. E.,	Erie, Route 2,	Erie.
Emerson, J. B., M.D.,	40 E. 41st St., New York, N. Y.,	Elk.
Emmons, Myron,	Rolfe,	Lancaster.
Engle, Ezra, B.,	Marietta,	Wayne.
Erk, George,	Seeleyville,	Cumberland.
Eslinger, Samuel L.,	Lemoyne,	Lancaster.
Espenshade, F. L.,	Refton,	Bradford.
Estabrook, F. L.,	Athens,	York.
Everhart, Geo. W.,	York,	York.

F.

Fassett, C. B.,	Mehoopany,	Wyoming.
Fassett, F. H.,	Meshoppen,	Wyoming.
Fassett, Wallace,	Mehoopany,	Wyoming.
Felix, Geo. C.,	Salix,	Cambria.
Felty, G. B. O.,	Millersville,	Lancaster.
Fenstermacher, P. S.,	Allentown,	Lehigh.
Fernald, Geo. H.,	North East,	Erie.
Fertiz, F. R.,	Lebanon,	Lebanon.
Fincken, Maurice F.,	5027 Florence Ave., Philadelphia,	Philadelphia.
Finn, A. O.,	Clifford,	Susquehanna.
Flinchbaugh, F. T.,	York,	York.
The Florex Gardens,	North Wales,	Montgomery.
Forry, Laroy S.,	Spring Forge,	York.
Forsyth, Samuel,	Jarrettstown,	Montgomery.
Foster, T. C.,	Winfield,	Union.
Frantz, S. P.,	Luzerne,	Luzerne.
Frear, Edgar C.,	Factoryville,	Wyoming.
Frederick, T. J.,	Springchurch,	Armstrong.
Freed, A. J.,	Racine,	Butler.
Freed, W. A.,	Racine, Route 2,	Butler.
Fridy, R. M.,	Mountville,	Lancaster.
Fromuth, Harry C., Jr.,	Southampton,	Bucks.
Fulton, H. R.,	State College,	Centre.

G.

Gammel, Emerson W.,	Honesdale,	Wayne.
Gardner, L. M., Jr.,	York Springs,	Adams.
Garrahan, R. H.,	Kingston,	Luzerne.
Garrettson, Eli P.,	Biglerville,	Adams.
Garrettson, Frank,	Aspers,	Adams.
Garretson, Robert,	Flora Dale,	Adams.
Gaston, W. F.,	Downingtown,	Chester.
Gay, Arthur,	Pittston, Route 1,	Luzerne.
Gelder, Chas. C.,	218 S. 38th St., Philadelphia,	Philadelphia.
Gibson, Bruce A.,	State College,	Centre.
Gibson, Ralph,	Williamsport,	Lycoming.
Gillespie, T. Frank,	Canonsburg, Route 3,	Washington.
Gilpin, Vincent,	West Chester,	Chester.
Good, Adam E.,	Gap, Route 1,	Lancaster.
Good, Martin R.,	Blue Ball,	Lancaster.
Gooderham, H. M.,	Patton,	Cambria.
Gorham, W. R.,	Muncy,	Lycoming.
Grafer, A. W.,	96 Diamond Market, Pittsburg,	Allegheny.

NAME.	POST OFFICE.	COUNTY.
Graybill, I. B.,	Refton,	Lancaster.
Green, C. A.,	44 Alumni Ave., Providence, R. I.,	
Green, James, Jr.,	Creighton,	Allegheny.
Grieb, C. B.,	Mill Hall,	Centre.
Griest, A. W.,	Flora Dale,	Adams.
Griest, C. A.,	Guernsey,	Adams.
Griest, C. S.,	Guernsey,	Adams.
Griest, Frederick E.,	Flora Dale,	Adams.
Griest, Geo. G.,	30 Church St., New York, N. Y.,	
Griest, Maurice E.,	105 W. 163 St., New York, N. Y.,	
Gross, W. E.,	Gibsonia,	Allegheny.
Guise, D. H.,	Emmitsburg, Md.,	
Gulden, Harry,	Aspers,	Adams.

H.

Hahne, Frank,	Dubois,	Clearfield.
Haines, Miss Mary M.,	Cheltenham,	Montgomery.
Hall, L. C.,	Avonia,	Erie.
Harbold, Isaac,	Wellsville,	York.
Harman, T. D.,	Pittsburg,	Allegheny.
Harris, Philip,	Light Street,	Columbia.
Harrison & Sons, J. G.,	Berlin, Md.,	
Harrold, William H.,	Greensburg, Route 2,	Westmoreland.
Harshman, U. W.,	Waynesboro,	Franklin.
Hartman, G. W.,	Marysville,	Perry.
Hartman, William,	Etters,	York.
Hassler, E. O.,	Linglestown,	Dauphin.
Haverstick, Paul E.,	Lancaster,	Lancaster.
Hawkins, E. B.,	York,	York.
Hayes, Dr. Robt. G. H.,	Bellefonte,	Centre.
Hazard, Willis H.,	West Chester,	Chester.
Heilman, R. P.,	Emporium,	Cameron.
Henning, J. C.,	North Mehoopany,	Wyoming.
Hepler, J. R.,	State College,	Centre.
Herr, Daniel D.,	Lancaster,	Lancaster.
Herr Frank H.,	Millersville,	Lancaster.
Herr, John D.,	Lancaster,	Lancaster.
Hershey, C. A.,	Tillie,	Adams.
Hershey, H. F.,	State College,	Centre.
Hershey, H. S.,	East Petersburg,	Lancaster.
Heyser, William,	Guldens,	Adams.
Hibshman, Geo.,	Ephrata,	Lancaster.
Hill, William D.,	North East,	Erie.
Hilton, H. R.,	Port Allegany,	McKean.
Hinkle, Horace,	York,	York.
Hoffman, Willis H.,	Biglerville,	Adams.
Holmes, H. L.,	o N 2nd St., Harrisburg,	Dauphin.
Hopkins, H. D.,	Mountville,	Lancaster.
Horton, Harry H.,	Sheffield,	Warren.
Howard, Josiah,	Emporium,	Cameron.
Howe, Homer B.,	Wellsboro,	Tioga.
Huff, B. P.,	Roanoke, Virginia,	
Hummel, P. T.,	631 Maclay St., Harrisburg,	Dauphin.
Hutchinson, R. H.,	51 Front St., New York, N. Y.,	
Hyde, A. A.,	Manns Choice,	Bedford.

I.

Ide, S. C.,	Alderson,	Luzerne.
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J.

Jacob, P. A.,	Wellsburg, W. Va.,	
Jacobs, Samuel,	Gettysburg, Route 5,	Adams.
Jacques, Mrs. Elizabeth H.,	Germantown,	Philadelphia.
Jarden, C. P.,	Delaware Ave. & Chestnut St., Phila.,	Philadelphia.
Johnston, C. B.,	North Warren, Box 82,	Warren.
Johnson, Howard M.,	Catawissa,	Columbia.

NAME.	POST OFFICE.	COUNTY.
Johnson, J. H.,	Wilcox,	Elk.
Jones, A. A.,	1810 Jefferson St., Philadelphia,	Philadelphia.
Jordan, J. H.,	811 Bessemer Bldg., Pittsburg,	Allegheny.

K.

Kane, J. A.,	Biglerville,	Adams.
Kauffman, Chas.,	Stony Brook,	York.
Kauffman, E. F.,	York, Route 3,	York.
Keeny, W. D.,	Manheim,	Lancaster.
Keeny, A. C.,	Laceyville,	Wyoming.
Keeny, Fred. B.,	Laceyville,	Wyoming.
Keifer, A. M.,	Greenville,	Mercer.
Kell, Reuben H.,	Blain,	Perry.
Kemp, Miss Mary V.,	613 N. 8th St., Philadelphia,	Philadelphia.
Kennedy, F. W.,	Franklin,	Venango.
Kepple, Clarence L.,	Leechburg, Route 3,	Armstrong.
Kernan, William,	Dushore,	Sullivan.
Kester, R. P.,	Grampian,	Clearfield.
Ketchum, E. M.,	North East,	Erie.
Kidder, O. S.,	North East,	Erie.
Kilmer, A. B.,	Springbrook,	Lackawanna.
Kimmel, A. F.,	Orwigsburg,	Schuylkill.
Kirsch, A. B.,	Nicktown,	Cambria.
Kleinfelter, U. S.,	Biglerville,	Adams.
Klock, W. J.,	Pitman,	Schuylkill.
Kloss, D. S.,	Tyrone,	Blair.
Klussman, F. C.,	Millvale,	Allegheny.
Knuppenburg, D. A.,	Lake Carey,	Wyoming.
Koons, Dr. P. R.,	Mechanicsburg,	Cumberland.
Koser, G. W.,	Biglerville,	Adams.
Krady, W. S.,	Mt. Joy,	Lancaster.
Kraybill, S. S.,	Mt. Joy, Route 1,	Lancaster.
Kreibel, Rev. O. S.,	Pennsburg,	Montgomery.
Krewson, James,	Cheltenham,	Montgomery.
Krug, H. G.,	205 S McKean St., Butler,	Butler.
Kunkel, Jonas,	New Ringgold,	Schuylkill.
Kunkel, N. J.,	New Ringgold,	Schuylkill.

L.

Lance, John H.,	Kingston,	Luzerne.
Large, Miss Katherine,	Orrtanna,	Adams.
Larner, John B.,	1709 19th St., Washington, D. C.,	
Lau, Rev. D. B.,	Hanover,	York.
Laub, H. H., Jr.,	Lewistown,	Mifflin.
Lawrence, H. A.,	Sunbury, Route 2,	Northumberland.
Lawrence, J. P.,	Sunbury,	Northumberland.
Lawver, Rufus,	Biglerville,	Adams.
Lee A. C.,	Waymart,	Wayne.
Lee, R. F.,	Somerset,	Somerset.
Leet, C. E.,	North East,	Erie.
LeFevre, T. C.,	5104 Brown St., Philadelphia,	Philadelphia.
Lehman, A. S.,	Chambersburg,	Franklin.
Leighton, Jas. G.,	Tunkhannock,	Wyoming.
Leonard, Frank E.,	Carlisle Springs,	Cumberland.
Lerch, Fred,	Scobeyville, N. J.,	
Leslie, William H.,	Arnold, Route 1,	Westmoreland.
Lewis, Bradley W.,	Tunkhannock,	Wyoming.
Lewis, E. P.,	Temple, Router,	Berks.
Lewis, H. G.,	Pittston, Route 1,	Luzerne.
Lewis, W. J.,	Pittston,	Luzerne.
Lick, Simon,	Marysville,	Perry.
Lightner, William A.,	Landisburg,	Perry.
Limbert, Benj.,	Spring Mills,	Centre.
Lincoln, Geo. H.,	410 Wheeler Ave., Scranton,	Lackawanna.
Lisle, R. Mason,	Paoli,	Chester.
Livezy, Albert,	Springbrook,	Lackawanna.
Lohman, Karl B.,	State College,	Centre.

NAME.	POST OFFICE.	COUNTY.
Loomis, Edw.,	North East,	Erie.
Lord, John,	Wyoming, Route 1,	Luzerne.
Lott, J. Kerr,	Gettysburg,	Adams.
Lotz, A. G.,	1610 S. 4th St., Philadelphia,	Philadelphia.
Loucks, E. S.,	Soudertown,	Montgomery.
Love, B. D.,	Erie, Route 2	Erie.
Lowe, M. J.,	Bradford,	McKean.
Luke, W. J.,	Morganza,	Washington.
Lupp, R. M.,	Biglerville, Route 2,	Adams.
Lushen, A. F.,	Venetia, Route 2,	Washington.

M.

MacAskie, K. G.,	1648 Adams Ave., Scranton,	Lackawanna.
Mackintosh, R. S.,	State College,	Centre.
Macneal, William P.,	Parkesburg,	Chester.
MacVeagh, Walter F.,	Williamsport,	Lycoming.
Maffet, Miss M. A.,	264 S. Franklin St., Wilkes-Barre,	Luzerne.
Maloney Bros. & Wells,	Dansville, N. Y.	
Martin, A. L.,	Harrisburg,	Dauphin.
Masters, A. S.,	Pittston,	Luzerne.
Mayer, Dr. I. H.,	Willow Street,	Lancaster.
McAllen, R. W.,	Fannettsburg,	Franklin.
McBride, C. G.,	State College,	Centre.
McCaleb, William B.,	Harrisburg,	Dauphin.
McCanna, Francis J.,	Falls,	Wyoming.
McClelland, J. B.,	Canonsburg,	Washington.
McClure, F. L.,	New Wilmington,	Lawrence.
McCord, William C.,	Mendenhall,	Chester.
McDonald, James A.,	North East,	Erie.
McDonald, I. M.,	North East,	Erie.
McGowan, Howard G.,	Geigers Mills,	Berks.
McKay, Geo. H.,	1118 Arch St., Philadelphia,	Philadelphia.
McKnight, W. J.,	Girty,	Armstrong.
McLain, J. A.,	Allenport,	Washington.
McLaughlin, Jos. M.,	North East,	Erie.
McMurray, Levi A.,	Canonsburg, Route 4,	Washington.
McSparan, W. F.,	Furniss,	Lancaster.
McWilliams, H. C.,	State College,	Centre.
Meisenhelder, R. N.,	Hanover,	York.
Menger, G. A.,	Factoryville,	Wyoming.
Metzger, S. S.,	Bedford,	Bedford.
Michael, J. E.,	Norristown, Route 3,	Montgomery.
Michell, Henry F.,	518 Market St., Philadelphia,	Philadelphia.
Miller, Albert,	Lebanon, Route 10,	Lebanon.
Miller, A. Kent,	Somerset,	Somerset.
Miller, Edw. J.,	Leetsdale, Box 37,	Allegheny.
Miller, H. A.,	Williamsport,	Lycoming.
Miller, Maris T.,	Kennet Square,	Chester.
Miller, Norman,	Marion,	Franklin.
Minter, D. G.,	Gettysburg, Route 5,	Adams.
Moon, James M.,	616 Stephen Girard Bldg., Phila.,	Philadelphia.
Moon, William H.,	Morrisville,	Bucks.
Moore, Benj. S.,	Culpsville,	Bucks.
Moorehead, E. T.,	North East,	Erie.
Moorehead, J. A.,	Mooreheadville,	Erie.
Moorehead, R. J.,	North East,	Erie.
Mottier, C. H.,	North East,	Erie.
Murphy, S. I.,	Wawa,	Delaware.
Murray, D. E.,	Catawissa,	Columbia.
Musselman, C. H.,	Biglerville,	Adams.
Musser, Will M.,	Lampeter,	Lancaster.
Myers, C. E.,	Ithaca, N. Y.,	
Myers, Geo. P.,	Biglerville,	Adams.
Myers, Harry C.,	Siddonsburg,	York.
Myers, John R.,	Siddonsburg,	York.

NAME.	POST OFFICE.	COUNTY.
Naudascher, Chas. F.,	1720 N. 12th St., Philadelphia,	Philadelphia.
Neilson, John,	Trooper,	Montgomery.
Nevin, John D.,	Easton,	Northampton.
Newbrough, W. H.,	Lansing, Mich.,	
Newcomer, Aaron,	Midvale,	Franklin.
Newcomer, W. S.,	Glenrock,	York.
Nissley, A. H.,	Bamford,	Lancaster.
Nissley, Walter B.,	State College,	Centre.
Noble, H. P.,	Waymart,	Wayne.
Norris, H. E.,	North East,	Erie.
Northrup, A. M.,	Ashley,	Luzerne.
Norton, W. C.,	Waymart,	Wayne.
Norton W. M.,	Waymart, Route 1,	Wayne.

O.

O'Neill, William C.,	2211 W. Tioga St., Philadelphia,	Philadelphia.
Oldach, I. F.,	North East,	Erie.
Oppenlander, Emanuel,	Passer,	Bucks.
Orton Bros.,	North East,	Erie.
Oyler, Geo.,	Gettysburg, Route 5,	Adams.

P.

Patterson, Jas. A.,	Stewartstown,	York.
Peachy, J. H.,	Belleville,	Mifflin.
Peirce, Ernest F.,	York,	York.
Pelton, J. L.,	North Girard,	Erie.
Pelton, W. C.,	State College,	Centre.
Pennel, Jos.,	Wawa,	Delaware.
Pennock, Edw. A.,	Chatham,	Chester.
Perham, W. E.,	Pleasant Mount,	Wayne.
Perry, J. J.,	State College,	Centre.
Pershing, Thed.,	127 Clividen Ave., Mt. Airy,	Philadelphia.
Peters, Earl,	Carlisle,	Cumberland.
Phillips, M. T.,	Pomeroy,	Chester.
Pierce, B. R.,	North East,	Erie.
Pierce, Geo. E.,	North East,	Erie.
Pitzer, H. C.,	Aspers,	Adams.
Pollock, Geo. B.,	Wyoming,	Luzerne.
Pomeroy, John H.,	Chambersburg,	Franklin.
Potter, Edwin P.,	Thompson,	Susquehanna.
Pratt, B. G.,	50 Church St., New York N. Y.,	
Prickett, J. W.,	Aspers,	Adams.
Purdy, H. P.,	Sunbury,	Northumberland.
Pyle, Robert,	West Grove,	Chester.

Q.

Quigley, J. E.,	466 S. Rebecca St., Pittsburg,	Allegheny.
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R.

Raffensperger, Chas. E.,	Arendtsville,	Adams.
Raffensperger, Roy M.,	Arendtsville,	Adams.
Rakestraw, Thomas,	Kennett Square,	Chester.
Ramer, S. B.,	Camp Hill,	Cumberland.
Rawle, Francis,	West End Bank Bldg., Philadelphia,	Philadelphia.
Reed, Fred B.,	Chambersburg,	Franklin.
Reifsnyder, Geo.,	Phoenixville, Route 1,	Chester.
Reifsnyder, Jas.,	Phoenixville, Route 1,	Chester.
Reith, Geo., Jr.,	Wyoming, Route 1,	Luzerne.
Repp, Albert T.,	Glassboro, N. J.,	
Rettew, C. Vernon,	1000 N. 3rd. St., Harrisburg,	Dauphin.
Rice, Daniel,	New Bloomfield,	Perry.
Rice, Louis S.,	Scranton,	Lackawanna.

NAME.	POST OFFICE.	COUNTY.
Rice, Oscar C.,	Biglerville,	Adams.
Rice, Waybright,	Biglerville,	Adams.
Richards, A. C.,	Schellburg,	Bedford.
Riddlemoser, H. E.,	McKnightstown,	Adams.
Rife, J. L.,	Camp Hill,	Cumberland.
Rinehart, E. S.,	Mercersburg,	Franklin.
Rinehart, Geo. W.,	York, Route 4,	York.
Rittenhouse, Dr. J. S.,	Lorane,	Berks.
Robinson, Byron H.,	Meshoppen,	Wyoming.
Robinson, F. J.,	Honesdale, Route 3,	Wayne.
Rohland, Otto,	Narrowsburg, N. Y., Route 1,	
Root, A. W.,	Manheim,	Lancaster.
Root, J. W.,	Manheim,	Lancaster.
Ross, A. B.,	Schellburg,	Bedford.
Rouf, Frederick,	Hummelstown,	Dauphin.
Roynan, Richard,	Centre Square,	Montgomery.
Rozelle, H. E.,	Pittston,	Luzerne.
Ruhl, Harry F.,	Manheim,	Lancaster.
Runk, John A.,	Green Ridge, Md.,	
Rupp, D. C.,	Shiremanstown,	Cumberland.
Rush, John G.,	West Willow,	Lancaster.

S.

Sampson, H. O.,	Scranton,	Lackawanna.
Satterthwait, A. F.,	Middletown,	Dauphin.
Saylor, J. C.,	Pottstown,	Montgomery.
Schell, William A.,	West Chester,	Chester.
Schell, Walter S.,	1307 Market St., Harrisburg,	Dauphin.
Scholl, Calvin, P.,	Halifax,	Dauphin.
Schraver, H. E.,	Hummelstown,	Dauphin.
Schuchman, G. W.,	Carlisle,	Cumberland.
Searfoss, W. H.,	Wyoming, Route 1,	Luzerne.
Sedelmeyer, L. H.,	North East,	Erie.
Shallcross, Frank R.,	Frankford,	Philadelphia.
Shay, M. E.,	Holmsburg,	Philadelphia.
Schaeffer, Henry C.,	Dillsburg, Route,	York.
Shoemaker, Seth W.,	Scranton,	Lackawanna.
Shoener, John,	New Ringgold,	Schuylkill.
Shorb, Albert,	Hanover,	York.
Shreve, Milton W.,	Masonic Temple Bldg., Erie,	Erie.
Seigfried, A. H.,	Selinsgrove,	Snyder.
Sierer, Dr. A. L.,	Mechanicsburg,	Cumberland.
Siegler, Franklin,	320 S. 44th St., Philadelphia,	Philadelphia.
Silvins, Geo. D.,	38 S. Wells St., Wilkes-Barre,	Luzerne.
Sloan, E. H.,	Orangeville,	Columbia.
Sloat, W. H.,	Camp Hill,	Cumberland.
Smedley, S. L.,	Bala,	Montgomery.
Smith, Arthur H.,	State College,	Centre.
Smith, C. M.,	Lewistown,	Mifflin.
Smith, Geo. W.,	Melrose, Conn.,	
Smith, Russel J.,	Swarthmore,	Delaware.
Smith, Morrell,	State College,	Centre.
Smith, W. O., M.D.,	15 S. Market Square, Harrisburg,	Dauphin.
Snively, Hon. H. C.,	Cleona,	Lebanon.
Snively, J. R.,	Harrisburg,	Dauphin.
Snyder, C. B.,	Ephrata, Route 1,	Lancaster.
Snyder, E. B.,	Jacks Mountain,	Adams.
Snyder, F. A.,	Pittston, Route 1,	Luzerne.
Stahle, C. E.,	Gettysburg,	Adams.
Stanton, Jas. F.,	New Stanton,	Westmoreland.
Starr, W. C.,	New Brighton,	Beaver.
Steele, Wilfred W.,	35 Hillside Ave., Franklin,	Venango.
Stein, Geo. E.,	East Prospect,	York.
Stephens, A. W.,	Mooreburg,	Montour.
Stevens, C. E.,	Duncannon,	Perry.
Stewart, J. P.,	Ithaca, N. Y.,	
Stewart, William,	Landisburg,	Perry.
Stigers, Jas. H.,	Hancock, Md.,	

NAME.	POST OFFICE.	COUNTY.
Stock, Karl F.,	Wyoming, Route 1,	Luzerne.
Stough, W. W.,	Shippensburg,	Cumberland.
Stouffer, Dr. C. B.,	Gettysburg,	Adams.
Stover, F. S.,	Bowmansville,	Lancaster.
Stow, W. L.,	North East,	Erie.
Strasbaugh, E. F.,	Orrtanna,	Adams.
Strode, A. D.,	West Chester,	Chester.
Strong, Robert J.,	Shiresmantown,	Cumberland.
Stull, James B.,	North East,	Erie.
Surface, H. A.,	Mechanicsburg,	Cumberland.
Swank, Luke H.,	Swank Bldg., Johnstown,	Cambria.
Swartwood, Morris,	Ransom, Route 1,	Lackawanna.

T.

Taunehill, Newton,	Canonsburg, Route 3,	Washington.
Taylor, A. M.,	Biglerville,	Adams.
Taylor, B. C.,	Chester,	Delaware.
Tennant, J. G.,	Westfield, N. Y.,	
Thomas, Carl B.,	Devon,	Chester.
Thomas, Chas. L.,	King of Prussia,	Montgomery.
Thomas, Jackson M.,	Emporium,	Cameron.
Thompson, John I., Jr.,	Lemont,	Centre.
Thompson, A. F.,	Lykens,	Dauphin.
Thorpe, Francis Newton,	Mt. Holly, N. J.,	
Throne, S. E.,	York, Route 3,	York.
Townsend, H. A.,	Light Street,	Columbia.
Treible, C. E.,	Vosburg,	Wyoming.
Trexler, T. A.,	Sunbury,	Northumberland.
Tritt, S. J.,	Huntsdale,	Cumberland.
Trostle, F. C.,	York Springs,	Adams.
Trout, H. E.,	Manheim,	Lancaster.
Tyson, A. R.,	Norristown,	Montgomery.

V.

Vandergrift, H. R.,	Cheltenham,	Montgomery.
Van Horn, Edw.,	Dorranceton,	Luzerne.
Van Tuyle, G. M.,	Pittston,	Luzerne.

W.

Wadhams, Miss Lydia P.,	275 S. Franklin St., Wilkes-Barre,	Luzerne.
Wagner, Geo. A.,	Landisburg,	Perry.
Wagner, Harry S.,	Carlisle,	Cumberland.
Wakelin, Amos,	632 Land Title Bldg., Philadelphia,	Philadelphia.
Wakelin, Miss Grace V.,	Ambler,	Montgomery.
Waldo, W. S.,	North Girard,	Erie.
Walter, William,	Blairsville,	Indiana.
Walton, Richard C.,	State College,	Centre.
Walton, Robert J.,	Hummelstown,	Dauphin.
Watterson, W. F.,	Cleveland, Ohio,	
Watts, E. L.,	Myerstown,	Lebanon.
Watts, R. L.,	State College,	Centre.
Way, Darlington,	Port Matilda,	Centre.
Weaver, Abram,	Windber,	Somerset.
Weidner, A. I.,	Arendtsville,	Adams.
Weigle, H. M.,	Harrisburg,	Dauphin.
Wells, W. D.,	North East,	Erie.
Weimer, E. A.,	Lebanon,	Lebanon.
Wert, S. H.,	State College,	Centre.
Westrick, F. A.,	Patton, Route 2,	Cambria.
Whitlock, J. B.,	West Pittston,	Luzerne.
Wickersham, R. A.,	Mechanicsburg,	Cumberland.
Wiese, H. B.,	Parkesburg,	Chester.
Wills, F. A.,	1206 Montgomery Ave., Phila.,	Philadelphia.
Wilder, H. J.,	State College,	Centre.
Wiley, J. C.,	Bridgeton,	York.
Williams, J. L.,	Gettysburg,	Adams.

NAME.	POST OFFICE.	COUNTY.
Willson, H. M.,	Sharon,	Mercer.
Wilson, B. F.,	Aspers,	Adams.
Wilson, J. L.,	Overbrook,	Philadelphia.
Windle, Francis,	West Chester,	Chester.
Winings, A. H.,	Columbia,	Lancaster.
Winship, Lionel,	Moscow,	Lackawanna.
Withrow, J. C.,	Vanport,	Beaver.
Wolfe, Chas. A.,	Aspers,	Adams.
Wolf, Dr. W. E.,	Arendtsville,	Adams.
Woodbourne, D. Sterrett,	Shippensburg,	Cumberland.
Woodside, T. Frank,	1210 Chestnut St., Philadelphia,	Philadelphia.
Woodward, Albert L.,	3312 Haverford Ave., Phila.,	Philadelphia.
Worrell, Hibberd B.,	555 N. 17th St., Philadelphia,	Philadelphia.
Wright, A. Cooper,	Hummelstown,	Dauphin.
Wright, Robert C.,	Broad St. Station, Philadelphia,	Philadelphia.
Wright, W. J.,	State College,	Centre.

Y.

Yentzer, J. R.,	Conestoga,	Lancaster.
Young, Williard S.,	218 Briggs St., Harrisburg,	Dauphin.
Yoder, J. W.,	Ivyland,	Bucks.

Z.

Zigler, Amos,	Elizabethtown,	Lancaster.
Zimmerman, D. B.,	Somerset,	Somerset.
Zimmerly, H. H.,	State College,	Centre.

Membership by Counties

A careful study of this matter has proved so interesting to those who are most concerned in the growth of the Society, that it seems worth while to give it a little space again this year. These are the numbers up to April 1st 1911.

57 Adams.	8 Berks, Bucks and Lebanon.
44 Lancaster.	6 Bedford, Columbia, Lycoming, North-
38 Erie.	umberland, Schuylkill and West-
35 Dauphin and York.	moreland.
32 Chester.	5 Delaware.
30 Centre and Luzerne.	4 Mifflin and Somerset.
28 Philadelphia.	3 Armstrong, Beaver, Bradford, But-
22 Montgomery.	ler, Cameron, Elk, Juniata, Lehigh,
20 Cumberland.	McKean and Susquehanna.
19 Wyoming.	2 Blair, Clearfield, Lawrence, Mercer,
15 Franklin.	Snyder, Venango and Warren.
13 Lackawanna.	1 Clinton, Crawford, Fayette, Greene,
12 Perry.	Indiana, Jefferson, Montour, North-
11 Allegheny.	ampton, Potter, Sullivan, Tioga and
10 Wayne.	Union.
9 Cambria and Washington.	

It is significant of what the right of membership means to those who hold it, that the Counties highest in the list last year are, for most part, the ones which show the best gains this year.

We believe members will be interested in the following reprint from 1910 report.

The following list shows the number of Annual and 1910 Members in each county.

This matter of county membership is a perfectly proper field for competition and the officers are glad to encourage friendly rivalry in this direction.

Erie County heads the list this time, but already there are rumors that Adams County will be out for the lead next year. Erie is strong and spunky and the prospect is good for a lively contest. In the mean time it is perfectly possible that Wyoming or Lancaster or Centre, with State College to draw on, may beat both. The County that leads next year will have a fine representation in the State Association; mark my word!

64 Erie.	4 Allegheny, Berks, Lebanon and Lack-
25 Adams.	awanna.
25 Wyoming.	3 Beaver, Bedford, Butler, Cambria,
24 Centre.	Columbia and Somerset.
23 Lancaster.	2 Blair, Bradford, Bucks, Indiana,
22 Dauphin.	Juniata, Lycoming, Mifflin, North-
15 Chester and Luzerne.	ampton, Tioga, Union and West-
11 Philadelphia and York.	moreland.
9 Franklin and Montgomery.	1 Armstrong, Clarion, Clinton, Craw-
7 Wayne.	ford, Delaware, Jefferson, Lehigh,
6 Cumberland.	Monroe, Snyder, Sullivan, Susque-
5 Northumberland and Perry.	hanna Warren and Washington.

County Membership Trophy

A fine silver cup is offered to the County making the *most gain* in the coming year, as shown by the list to be printed in the 1912 Report, not necessarily the *largest membership* but the *most gain* over the 1911 list; the cup to be delivered to the County Association or to the County member of the Membership Committee where no County Association exists.

Roll of Honor

The following have qualified for the 1911 Roll of Honor, by securing five or more members, one life member counting as ten annuals. The Treasurer and Secretary are not eligible:

Miss M. A. Maffet,	H. L. Anwyll.
T. C. Foster.	J. R. Hepler.
R. J. Walton.	J. Frank Gillespie.
E. B. Engle.	C. E. Raffensperger.
E. F. Peirce.	J. L. Rife.
A. D. Strode.	R. F. Lee.
E. P. Garrettson.	A. R. Tyson.
C. A. Wolfe.	J. C. Withrow.
A. O. Finn.	W. C. Pelton.
H. H. Snavely.	S. L. Brinton.
W. C. Tyson.	C. P. Barnard.

CONSTITUTION.

ARTICLE 1.—*Name and Object.* The name of this organization shall be The State Horticultural Association of Pennsylvania. Its object shall be to foster and encourage the development of horticulture in the State of Pennsylvania.

ARTICLE 2.—*Membership.* Any person may become an Annual Member of this Association by paying one dollar (\$1.00) to the Secretary, such membership to expire on the first day of the following annual meeting, unless renewed. Any one paying ten dollars (\$10.00) to the Secretary at one time shall be entitled to Life Membership. Persons of distinguished merit in horticulture may be elected to Honorary Membership for the *current year*, by a majority vote of the members present at any regular meeting.

ARTICLE 3.—*Officers.* The officers shall consist of a President, three Vice-Presidents, a Secretary and a Treasurer, all of whom shall be elected by ballot at each annual meeting, to hold office for one year, or until their successors shall be chosen, except that the retiring Secretary shall edit the report of the annual meeting at which his successor is elected. These *elective* officers shall constitute an Executive Board in conjunction with an additional indeterminate number of Vice-Presidents whose names shall be announced by the Secretary at the annual election of officers. These Vice-Presidents shall be the regularly elected Presidents of any County Associations, organized in Pennsylvania for horticultural purposes, whose Constitution is approved by the Executive Board and whose income from annual membership dues during the preceding year was not less than ten dollars (\$10.00). In order to secure admittance to this Board, the Secretary of such County Association shall certify to the Secretary of the State Association, that the applicant has been duly elected to serve as their President for the current year and shall also submit a statement showing number of members and amount of dues paid for the preceding year. All officers must be members of the Association in good standing at the time of their election and shall assume their duties at the close of the meeting at which they were elected.

ARTICLE 4.—*Quorum.* Twenty-five (25) members of the Association and five (5) members of the Executive Board shall constitute a quorum for the transaction of business.

ARTICLE 5.—*Standing Committees.* The following Standing Committees shall be appointed by the President to serve during his term of office: A Committee on Legislation, to consist of three (3) members; a Committee on Exhibitions to consist of five (5) members; a Committee on Membership to consist of one (1) member from each county in the State showing evidence of horticultural

activity, and a General Fruit Committee, consisting of one from each county represented, with a general chairman of the whole, each member of the Fruit Committee to have the privilege of appointing two assistants.

ARTICLE 6.—*Annual Meeting.* The Annual Meeting of this Association shall be held during the month of January in each year, at such time and place as the Executive Board shall determine.

ARTICLE 7.—*Amendments to the Constitution.* This Constitution may be amended by a two-thirds vote of the members present at any annual meeting, provided such amendment shall have been presented to the Secretary in writing at least sixty (60) days prior to time of holding the annual meeting, and by him referred to all members in connection with the announcement of said meeting.

BY-LAWS.

ARTICLE 1.—*Duties of the President.* The President shall be the executive officer of the Association and of the Executive Board, and shall preside at all meetings of either body, designating one of the Vice-Presidents to serve in his stead when necessarily absent. He shall pass upon all bills and accounts of the Association before they are ordered paid by the Secretary; he shall appoint all delegates to other Associations and all special and standing committees of the Association unless otherwise ordered.

ARTICLE 2.—*Duties of Vice-Presidents.* The Vice-Presidents shall serve on the Executive Board and any one of them may be called upon by the President or the Executive Board to assume the duties of the Chair at any meeting. They shall also actively represent the Association in its various lines of work in their respective counties.

ARTICLE 3.—*Duties of the Secretary.* The Secretary shall be the recording, corresponding and accounting officer of the Association and of the Executive Board; he shall incur no expenditure of a large or doubtful character without the sanction of the Business Committee; he shall secure the written approval of the President on all bills or claims against the Association before drawing his order on the Treasurer for the payment thereof; he shall attend all meetings of the Association and of the Executive Board and shall keep a faithful record of their proceedings; he shall sign all certificates of membership and all Diplomas and Certificates of Merit, awarded by the Association. All money received by him shall be promptly paid to the Treasurer. He shall have charge of the Association's books and papers and shall be responsible to the Board for all property placed in his charge; he shall be the custodian of the Seal of the Association, and shall have authority to affix same to documents when needful; he shall seek by all suitable means to secure the fullest announcement of the meetings of the

Association in this State, as well as in adjacent states, when such shall be found desirable. It shall also be his duty, yearly, to prepare for publication, the Annual Report of the Association, together with such other matter as he shall deem proper, he being aided in the selection of such matter by an advisory committee of the Executive Board. As recompense, the Secretary shall receive all necessary expenses, and such salary as may be determined by the Executive Board.

ARTICLE 4.—*Duties of the Treasurer.* All the funds of the Association shall be paid into the hands of the Treasurer; he shall disburse the moneys of the Association that shall come into his hands only upon order of the Secretary, countersigned by the President; he shall keep the moneys received by the Association for Life Memberships as a distinct fund, and shall invest the same under the advice and direction of the Executive Board, applying only the interest accruing thereon to the purpose of the general fund. Immediately upon assuming his office and before entering upon his duties, he shall execute to the Association an official bond with sufficient securities conditioned for the safe-keeping and disbursement of the moneys of the Association, and for the proper discharge of the further duties of his office, in such sum as shall be specified by the Executive Board, the premium on which shall be paid by the Association. This bond shall receive the approval of the President, and shall be deposited with the Secretary. Immediately preceding the annual meeting, he shall submit to the Executive Board a written report showing the amount of money that shall have come into his hands during the year, the sources from which it has been derived, and the disposition made of the same. This statement shall be published in the Annual Report of the Association.

ARTICLE 5.—*Duties of the Executive Board.* The Executive Board shall enact all rules and regulations for the management of the affairs of the Association, determine the salaries of its officers, and assume the control and management of its exhibitions; it shall have power to displace any officer of the Association for neglect of duty or abuse of position; shall fill all vacancies by appointment to continue until the next annual election; and shall hold at least two regular sessions during the year, one of which shall occur at the time and place of the annual meeting of the Association. It may hold other meetings when called by the Secretary under the advice or direction of the majority of the members of the Board at such times and places as may be deemed most convenient, but in all such cases, each member must be duly notified of the time, place, and object of such meeting; it shall carefully guard the interests of the Association, watch over its finances and provide for its necessities as they shall arise; it shall appoint from its own number three members, who shall constitute a Business Committee for the year, and upon which the Secretary and Treasurer may not serve; and it shall submit to the Annual Meeting, through the Secretary, such report upon the condition, general interests and prospects of the Associa-

tion as it shall judge necessary or expedient. All important measures shall be submitted to this Board, but may, by the Board, be re-submitted to the Association for recommendations.

ARTICLE 6.—*Duties of the Business Committee.* It shall be the duty of the Business Committee, upon application of the Secretary, during the recess of the Executive Board, to advise with him as to the expediency of making any contemplated but questionable expenditure for which occasion may arise during such recess. The Business Committee shall also audit the accounts of the Secretary and the Treasurer just prior to the annual meeting and submit written report of its findings to the Executive Board.

ARTICLE 7.—*Duties of the Standing Committees.* (1). The Committee on Legislation shall inform itself in regard to such existing laws as relate to the horticultural interests of the state and bring the same to the attention of the Association, at the same time reporting any additional legislation which in their judgment is desirable; when so directed by the Association, it shall cause to be introduced into the State Legislature such bills as may be deemed necessary and shall aid or oppose any bills introduced by others which directly or indirectly affect the interests of the fruit grower.

(2). The Committee on Exhibitions shall suggest from time to time such methods and improvements as may seem to them desirable in conducting the exhibitions of the Association, as well as other fruit exhibitions throughout the state, and with the assistance of the Executive Board, shall arrange the premium lists, and have charge of all exhibitions of the Association.

(3). The Committee on Membership and Expansion, with the co-operation of the County Vice-Presidents, shall bring the work of the Association to the attention of fruit growers throughout the state, and by such means as they deem best, strive to increase the membership.

(4). The General Fruit Committee shall carefully and thoroughly investigate the subject of fruit culture in general. Each local committee of three shall collect such useful and interesting information in relation to the subject as may be in their power, and embody the same in monthly reports, to be made to the general chairman; such reports to be by him examined and embodied in his annual and semi-annual reports.

Such other Standing Committees may be created by the Executive Board from time to time, as in its discretion may seem desirable or necessary.

All Standing Committees shall report to the Annual Meeting in January, any information of value to the Association or its members, that may have come to their knowledge during the year, as well as any scientific theories, deductions or facts that in their opinion may be useful in advancing the object for which the Association is laboring.

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THE COVER ILLUSTRATIONS

Engraved from Photographs.

FRONT COVER, YORK IMPERIAL,

Grown by Tyson Bros., Flora Dale, Pa.

BACK COVER, WINTER BANANA,

Grown by H. M. Keller, Gettysburg, No. 5, Pa.

PROCEEDINGS

OF THE
FIFTY-FIRST ANNUAL MEETING
OF THE
State Horticultural Association
of Pennsylvania,

HELD AT

Harrisburg, Pa., January 24, 25, 26, 1911.

The Fifty-second Annual Meeting of the State Horticultural Association of Pennsylvania convened in the Board of Trade Building, Harrisburg, at 1.30 o'clock, Tuesday afternoon, January 24, 1911, with the president, Mr. Gabriel Hiester, in the chair.

The meeting was called to order by the President, who immediately proceeded with the

PRESIDENT'S ADDRESS.

It is very pleasant to greet you again after a separation of a year, during which time we have all been working along practically the same line, thinking the same thoughts, fighting the same enemies, and, judging by the expression of the faces before me, reaping the same reward. Although we had some partial failures, owing to unfavorable weather conditions at critical periods, and some of us were badly scared for a few days during peach harvest, I think the year taken as a whole, has been a profitable one to the members of this association, and we have reason to congratulate ourselves on a bright prospect for the future.

The fruit exhibit in the other room tells the story of the possibilities of our soil and climate better than the words of any speaker, and those of us who have watched the exhibit from year to year can read a history of rapid advancement in the art and science of growing fruit. It shows advance in horticultural knowledge, improvement in business methods, and a general healthy growth in all directions. While it is right for us to feel a just pride in the progress we have made, it will not do for us to sit down and fold our hands, even for a day. If we were to take into account the great natural advantages of soil and climate in Pennsylvania for growing fruit, and the splendid markets that we have right at our doors, we must realize that we are not living up to our opportunities. Commercial orchards have been planted in a few localities, but there are yet

Association in this State, as well as in adjacent states, when such shall be found desirable. It shall also be his duty, yearly, to prepare for publication, the Annual Report of the Association, together with such other matter as he shall deem proper, he being aided in the selection of such matter by an advisory committee of the Executive Board. As recompense, the Secretary shall receive all necessary expenses, and such salary as may be determined by the Executive Board.

ARTICLE 4.—*Duties of the Treasurer.* All the funds of the Association shall be paid into the hands of the Treasurer; he shall disburse the moneys of the Association that shall come into his hands only upon order of the Secretary, countersigned by the President; he shall keep the moneys received by the Association for Life Memberships as a distinct fund, and shall invest the same under the advice and direction of the Executive Board, applying only the interest accruing thereon to the purpose of the general fund. Immediately upon assuming his office and before entering upon his duties, he shall execute to the Association an official bond with sufficient securities conditioned for the safe-keeping and disbursement of the moneys of the Association, and for the proper discharge of the further duties of his office, in such sum as shall be specified by the Executive Board, the premium on which shall be paid by the Association. This bond shall receive the approval of the President, and shall be deposited with the Secretary. Immediately preceding the annual meeting, he shall submit to the Executive Board a written report showing the amount of money that shall have come into his hands during the year, the sources from which it has been derived, and the disposition made of the same. This statement shall be published in the Annual Report of the Association.

ARTICLE 5.—*Duties of the Executive Board.* The Executive Board shall enact all rules and regulations for the management of the affairs of the Association, determine the salaries of its officers, and assume the control and management of its exhibitions; it shall have power to displace any officer of the Association for neglect of duty or abuse of position; shall fill all vacancies by appointment to continue until the next annual election; and shall hold at least two regular sessions during the year, one of which shall occur at the time and place of the annual meeting of the Association. It may hold other meetings when called by the Secretary under the advice or direction of the majority of the members of the Board at such times and places as may be deemed most convenient, but in all such cases, each member must be duly notified of the time, place, and object of such meeting; it shall carefully guard the interests of the Association, watch over its finances and provide for its necessities as they shall arise; it shall appoint from its own number three members, who shall constitute a Business Committee for the year, and upon which the Secretary and Treasurer may not serve; and it shall submit to the Annual Meeting, through the Secretary, such report upon the condition, general interests and prospects of the Associa-

tion as it shall judge necessary or expedient. All important measures shall be submitted to this Board, but may, by the Board, be re-submitted to the Association for recommendations.

ARTICLE 6.—*Duties of the Business Committee.* It shall be the duty of the Business Committee, upon application of the Secretary, during the recess of the Executive Board, to advise with him as to the expediency of making any contemplated but questionable expenditure for which occasion may arise during such recess. The Business Committee shall also audit the accounts of the Secretary and the Treasurer just prior to the annual meeting and submit written report of its findings to the Executive Board.

ARTICLE 7.—*Duties of the Standing Committees.* (1). The Committee on Legislation shall inform itself in regard to such existing laws as relate to the horticultural interests of the state and bring the same to the attention of the Association, at the same time reporting any additional legislation which in their judgment is desirable; when so directed by the Association, it shall cause to be introduced into the State Legislature such bills as may be deemed necessary and shall aid or oppose any bills introduced by others which directly or indirectly affect the interests of the fruit grower.

(2). The Committee on Exhibitions shall suggest from time to time such methods and improvements as may seem to them desirable in conducting the exhibitions of the Association, as well as other fruit exhibitions throughout the state, and with the assistance of the Executive Board, shall arrange the premium lists, and have charge of all exhibitions of the Association.

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many thousand acres of ideal fruit land on the foot hills of our mountain ranges, that will produce fruit as fine as any on exhibition here to-day that are absolutely neglected and not paying a dollar of profit to their owners. One of the objects of this association is to bring to the young men of the state a knowledge of the possibilities of these rough lands, and we will not rest contented until every acre of fruit land on the foothills of these great mountain ranges shall be planted in fruit, representing one vast peach and apple orchard extending diagonally across the state from the Maryland line to the banks of the Delaware in Pike County, and the northern tier of counties shall be vying with New York in the production of winter apples.

The question is often asked: "Don't you think there is danger of over production?" to which I reply not so long as we grow perfect fruit and pack honestly, and make a proper selection of varieties. For ten years I have been urging the importance of having an investigation made to ascertain the effect of different types of soil and subsoil on the various varieties of fruit, so that as new districts are opened up we may be able to plant only such varieties as will develop their best quality in that particular place. And my reason for so persistently referring to this subject is that the most costly mistakes I have made have been mistakes in the selection of varieties. After many unsuccessful attempts to interest the authorities higher up, at last through the influence of Dr. Hunt, Director of our Experiment Station, the Department at Washington consented to loan Mr. H. J. Wilder of the Bureau of Soils, to our station for one year. As most of you are aware he has been at work during the past summer and has secured much useful information from a number of widely different sections of our state, but not enough to make a connected or strictly accurate report. He has made an excellent start, and I think you are all beginning to appreciate the importance of this work, and will agree with me that we should not be satisfied with one year's service. I hope at the proper time you will pass a resolution asking a renewal of the loan.

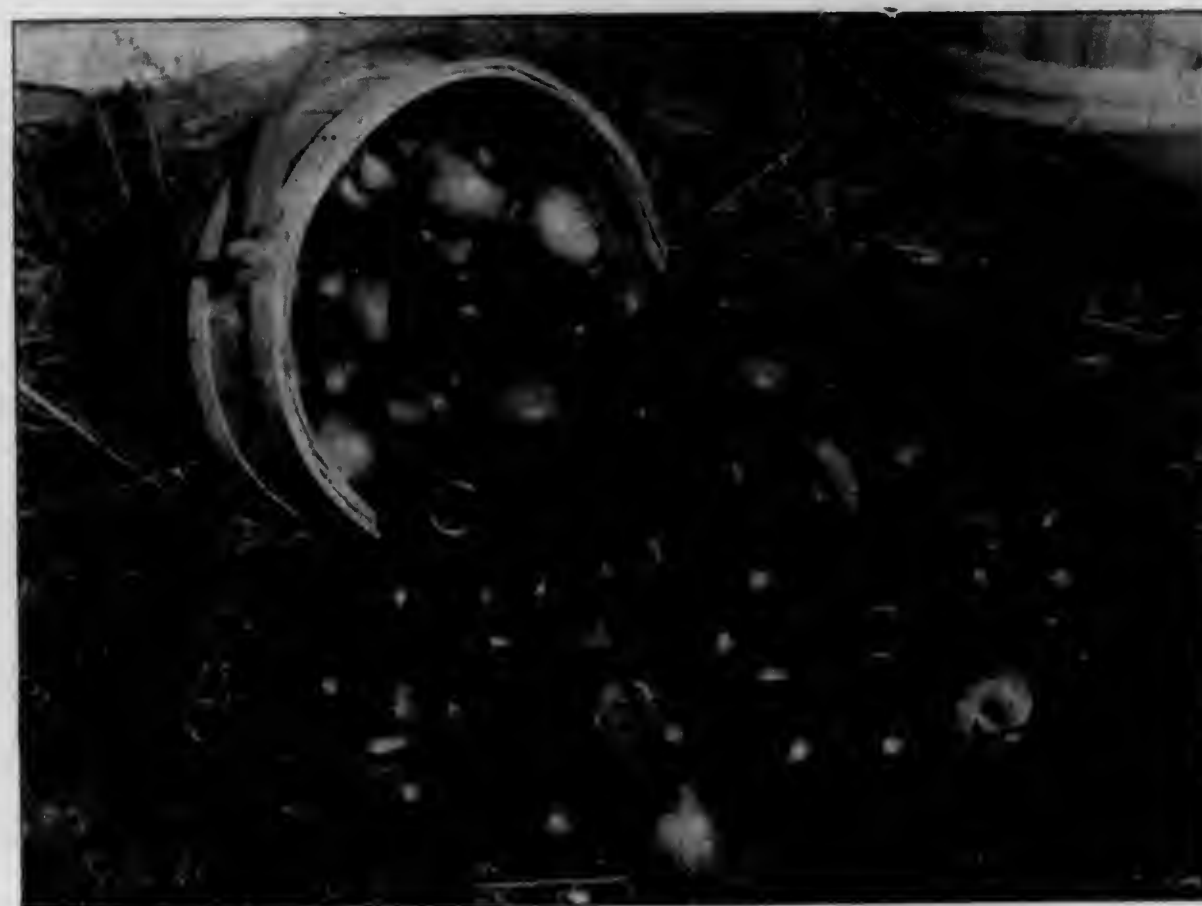
If we are going to grow apples extensively it seems to me they should be sold from Pennsylvania and go to the markets of the world as Pennsylvania fruit.

The western New York apple men are enthusiastic over a scheme to make Rochester the greatest apple market of the East. The plan contemplates the holding of a two weeks' apple show and sale in Rochester to draw buyers from all parts of the country. The first apple show and market will be held the last week of November and first week of December, 1911.

I believe we ought to begin to lay plans for a similar show and sale in Harrisburg. You may think I am a little premature in this matter, but I find it is well to have a definite plan to work on—a plan that will provide for conditions that are bound to arise in the future. In less than five years we will be in position to hold right here in Harrisburg as fine an apple show and market with as many barrels and boxes offered, as they can hold in Rochester next fall. I would suggest that our Executive Committee carefully note the progress

of New York along this line, as well as the marketing methods of the far western states and the peach growers of the South, so that we may be prepared to formulate a plan suited to our own conditions when our young orchards come into profitable bearing.

The importance of working together is being more forcibly illustrated each year. We have found it of advantage in our township and county associations. We have found it of advantage in our State Association. On the 21st of December The Eastern Fruit Growers' Association was formed, which is designed to take in all the state and county associations of the Eastern coast states. Our association is invited to join. I will ask our Secretary to bring the matter up for action at the proper time.



ADAMS COUNTY YORK IMPERIALS.
See paper of Prof. R. L. Watts.

In the matter of securing uniform legislation as to size of fruit packages and the grading of fruit we are invited to co-operate with New York, New Jersey, Michigan, Ohio and Virginia; this is a subject which concerns us all and I will ask the Secretary to make it an item of new business at one of our sessions.

We should keep in closer touch with the State Department of Agriculture and our State Experiment Station, they are all operated for our benefit and if we do not get as much from them as we think we are entitled to it is largely our own fault.

We find some very interesting results showing up in the orchard experiments of Professor Stewart; one especially attracted my attention. I referred to it in my report as Pomologist of the State Board of Agriculture, and consider it of sufficient importance to mention it here. Professor Stewart reports that nitrogen applied

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in the form of nitrate of soda to bearing apple trees in June after the fruit has formed, will increase the size of the fruit as well as the growth of the tree, but this increase in size is attended by loss of color in red apples; this loss of color Professor Stewart attributes to delayed ripening, and his opinion is that in those sections having a longer season—notably southern Pennsylvania—the fruit will regain most of its color. We all know if we spray our apple trees with a fungicide under proper weather conditions the foliage may be kept green and healthy until killed by frost, and when such is the case the fruit hangs on the tree much longer. This may mean a great deal to the orchardists in the York Imperial belt. If by the judicious use of nitrogen as a fertilizer and a proper fungicide as a summer spray we can hold our Baldwin, Spy, King and Smokehouse on the tree until the middle of October, by which time the sun will certainly have painted them the proper color, we can double the profits on these varieties—and will be encouraged to plant more of them than we are now doing.

Since our association was first formed conditions have changed very materially, so much so that we find our present Constitution does not meet the requirements of the times. During the interval between sessions, I have appointed a committee to take up this subject and in consultation with the Executive Committee suggest such changes as in their judgment are necessary. These amendments will be presented for your approval at this meeting. In conclusion I will quote a new year sentiment given by Governor Stewart because it is much better expressed than anything I can formulate: "Let us commence the new year by resolving to do something worth while, something that will be of benefit to some one besides ourselves, and let us make sure that at the end of 1911 we shall be able to say that we have been of real service to our fellow men, our city, our state, our nation. Let us eliminate as much of the selfishness in us as possible, so that when the next New Year comes around it may be truthfully said of us, that we have remembered that there are others."

REPORT OF THE GENERAL FRUIT COMMITTEE.

By MR. J. D. HERR, *Chairman, Lancaster, Pa.*

In offering this report I wish to state that the data herein contained are compiled from one hundred local reports received from members of our committee located in nearly every county in the State, in reply to a list of questions sent out about December 1st. I desire to express my appreciation of the assistance given me by the members of the committee, and my thanks are hereby extended to all who have so kindly and carefully answered the numerous questions submitted.

The yield of apples for the year 1910 appears to average 40% of a full crop. This average is kept low because of the reports of failure of the crop in the western half of the State, caused by a killing frost which visited that section about May 1st, after an un-

usually early spring had forced the trees into bloom. It is worthy of note that only orchards located on sites with faulty air drainage were affected, while others in the same locality, but situated more favorably, escaped uninjured.

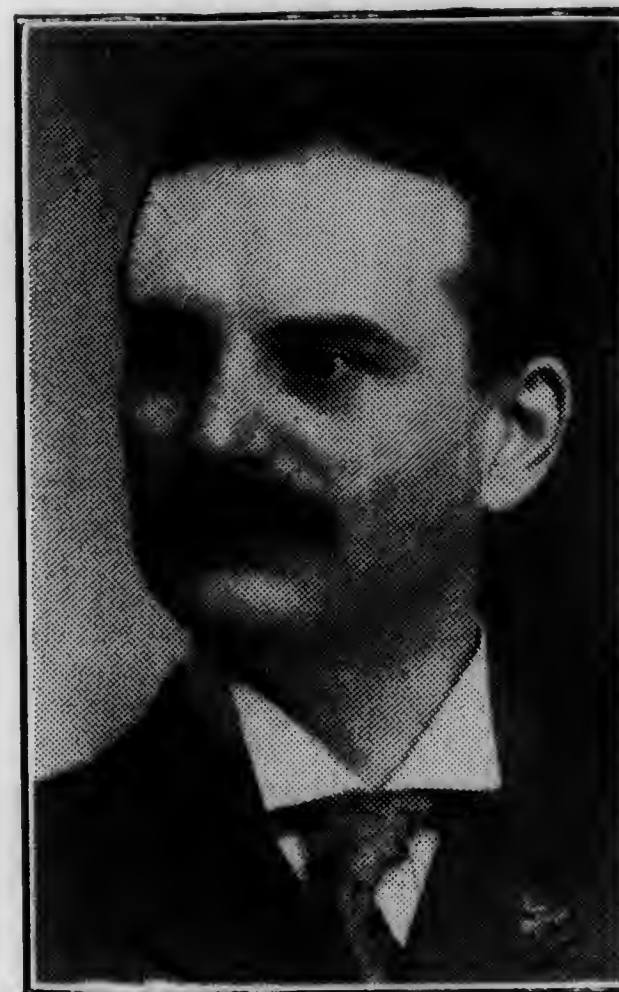
The quality of the fruit is reported as good and very good by over 50% of my correspondents. Twenty-five per cent report poor, while the remainder is divided between medium, fair and "good where sprayed." Prices vary as may be expected, about as widely as quality, and range from 50 cents per bushel and \$1.25 per barrel to \$3.00 and \$4.00 per barrel. The prices in the commercial sections seems to have been \$2.50 to \$2.75 per barrel net at the time of picking, while such growers as have stored their crops are now receiving a considerable advance on these prices.

Eighty per cent. reply in the affirmative to the question, "Is the crop profitable in your county?" and only 6% in the negative, and these explain in the next answer that the failure to make the crop pay is due to lack of care, neglect, and indifference on the part of the owner. We have here an eloquent commentary on the possibilities of fruit growing in this State. Commercial planting is reported on the increase from sixty counties, the varieties most planted being Stayman Winesap, York Imperial, Jonathan, Rome Beauty, Grimes Golden, Summer Rambo and Smokehouse, in order

named for the southeastern section of the State, while the Baldwin, Spy, Greening, Wealthy, Duchess, Stayman Winesap, McIntosh and York Imperial appear to be the favorite varieties for the remainder of the State.

In sharp contrast to the report of a year ago the yield of pears has been good, with few exceptions, all over the State. The few counties reporting poor yields or failures are included in the section visited by late frosts, and such failure is attributed to this cause. The price and quality was good, except in some cases for Kieffers. Only 15% of replies report commercial pear growing on the increase. Pear blight is without doubt the leading pest of this class of fruit trees, and may be a factor in preventing commercial planting.

San Jose scale, codling moth, borers, and leaf blight, are other destructive pests mentioned.



The peach crop of 1910 was without doubt one of the heaviest ever grown in this State, many counties reporting 100% of a full yield. There was a combination of favorable conditions in nearly all sections where peach trees thrive in this State for the production of a full crop of fine fruit, the quality being reported good from all such sections, while the prices received were somewhat lower this season than the preceeding, ranging from 50 cents to \$1.25 per basket, and averaging 80 cents. The crop is said to have been profitable in all sections of the State, except the northern tier of counties in addition to Cameron, Elk and Forest.

The most destructive pests of the peach are said to be yellows, San Jose scale, borers, monilia rot, curculio; while under this head are mentioned winter killing, vagabonds and neglect. No better evidence is needed to prove that the Pennsylvania peach grower knows the best methods of combating the pests common to this fruit than the uniformity with which these answers agree upon their treatment. Cutting out of trees infected with yellows, removing the borers, and spraying infested trees with Lime-sulphur Solution for scale insects, and as a protection against rot, is universally reported as giving the best results. The control of brown rot is, as yet, a problem only partially solved, since 60% report that this disease is not being controlled, a number having failed in their efforts to save their fruit, even by the use of the Lime-sulphur Washes. There is no doubt that most thorough going treatment must be applied to eradicate monilia rot from the orchard when it has once gotten a foothold, and pruning, gathering and destroying mummied fruits, as well as thinning, are giving best results in connection with the use of Lime-sulphur Sprays. All sections, except those already mentioned as not well adapted to the growing of peaches, report an increase in the planting of commercial peach orchards.

The yield of plums is given as fair to good over the State generally, with quality medium to very good, and the price averaged \$1.60 per basket. A few growers quote 20 cents to 30 cents per 8-pound basket, and this would seem to be a very good package in which to handle plums. The conditions governing the production of this crop were usually good, although a number of growers report late killing frosts as having curtailed the yield. Commercial planting of plums is not on the increase, except in half a dozen counties, and the varieties mostly grown are the German Prune, Lombard, Bradshaw, York State Prune, while a few prefer the Japanese varieties, as the Burbank, Abundance, and Satsuma. The curculio is without doubt the most serious pest affecting plums. This, with brown rot, black knot, San Jose scale, together with limited markets in most sections for the fruit, no doubt has tended to deter extensive planting.

Sixty per cent, of my correspondents state that cherries are not grown largely in their respective sections, although where they are grown they are nearly always profitable. As to the best varieties for shipping, Montmorency receives the largest number of votes, with the Early Richmond a close second. Following in order

are Dyehouse, Napoleon Biggareau, Black Tartarian, May Duke and Reine Hortense.

There is but one section of the State in which grape growing is carried on extensively, viz: the extreme northwestern, and here the crop has been fair to good. In the remainder of the State grapes are usually grown for home use, and to supply the local markets to a certain extent. The worst pests of the grape are black rot, mildew, grapeberry moth, rose bugs, and root worms. Concord, Niagara, Worden, Brighton, and Moore's Early are the principal varieties.

The favorite varieties of strawberries seem to be Haverland, Bubach, Dunlap, Sample, Glen Mary, Brandywine and William Belt. Of raspberries, the Gregg is the most popular, followed in order with Cumberland, Cuthbert and Kansas, as the best paying varieties of raspberries, and Snyder, Eldorado, Erie, Kittatinny, Merserau, are voted the hardiest and best blackberries. The only other small fruits grown with profit reported are currants, gooseberries and dewberries.



FIELD OF RHUBARB ON THE FARM OF MATTHEW HEIST.
See Address of Prof. R. L. Watts.

The past season has, as a rule, been favorable to the growth of vegetables, and tomatoes, potatoes, beans, peas, cabbage, corn, asparagus, and onions, are crops which have paid best. The crop is generally profitable, and potato bugs, cabbage worms, root maggots, asparagus beetles, and rust are the most destructive enemies. All but 6% of the replies contain the statement that the San Jose scale is now being held in check. The spray giving best results is Lime-sulphur solution, this being given in all but five replies, which name Scalecide in connection with Lime-sulphur. Twelve state that the oil sprays are unsatisfactory, and eight that these materials are in-

jurious to the trees, dentalizing them, closing the pores, cracking the bark, killing the bark and killing the tree.

Spraying for codling moth is becoming common throughout the State, and over three-fourths of the replies indicate that this pest is being successfully controlled by the use of arsenate of lead, Paris green and Pyrox. Only two failures to control codling moth with arsenical sprays are reported.

In spraying for the control of fungous diseases of the orchard a remarkable change has taken place in the selection of the fungicide. Bordeaux mixture, for many years the standard, must now yield to Lime-sulphur, the palm of popularity, since there are a slightly larger number of growers reporting good results from its use than from Bordeaux. The degree of dilution on apple and pear averages 1-30, while on peach it is reported as being used much weaker.

Collar rot is reported from fifteen sections of the State, and twig blight on apple, pear and quince from fifty. The only treatment reported successful is cutting out of diseased portions, spraying with a fungicide, and applying equal parts of lime and sulphur about the diseased collar of the tree.

Borers on apple, pear, peach and plum trees constitute a most serious menace to the industry of fruit growing, and 65% of the reports contain the statement that this pest is doing much damage in their respective sections. There is no perfect preventive of borers yet found, although a number of growers report fair success from the application on the trunk of whale oil soap solution, Lime-sulphur solution, liquid manure, white lead and raw linseed oil, unleached woodashes and wrappers. All recognize the necessity of cutting out borers when they have once entered the tree.

Mice and rabbits are doing considerable damage in many sections of the State, and it is evident that the proper steps are taken to prevent injury by these pests. Persons annoyed by them are cleaning up the rubbish in the orchards, killing the rabbits and applying to the trunk of trees in orchard where damage is anticipated, veneer, wire screens, white lead and raw oil, blood and salty lard. I have personally found one orchard which was abundantly infested with these pests absolutely protected for five years from these pests by one application of axle grease to the lower twelve inches of the trunk.

The use of fertilizers in the orchard is on the increase, and one-half of the reports state that the practice is followed in their community. The best results attend the application of stable manure or a complete fertilizer to the amount of 400 pounds, mixed after the formula of 2-8-10. The use of lime is well understood, and it is no longer applied generally as supplying any of the elements of fertility, but an occasional treatment for the purpose of sweetening the soil and setting free the elements of fertility by its chemical action upon vegetable and mineral matter.

On the subject of tillage most growers agree that young orchards should be cultivated either with or without an intercrop, a few answering that this is absolutely essential in the case of peach

orchards. Many are practicing clean cultivation up to July, when cover crops are sown, and crimson clover is the favorite among these. Rye, mammoth clover, vetch, buckwheat and oats are other crops grown for this purpose.

Thirty per cent. of replies state that mulching is practiced in orchards of their section, especially in orchards planted on hillsides with good and very good results.

A slight majority of correspondents advise against the practice of heavy pruning of apple and peach. A number qualify their replies by limiting this work to young trees only, and others take the medium ground that pruning should be done only when necessary.

There is a remarkable unanimity of opinion on the subject of thinning trees, all but two replying that this work can be done profitably.

The necessity of keeping bees in the orchard is still a mooted question, although the majority agree that bees play an important part in the pollination of the blossoms.

In order to learn the general sentiment prevailing throughout the State, the question was asked, "What has been the effects of experimental and demonstration work as conducted by State College and the Department of Agriculture?" and the replies received are "Good," from twenty-five reports; "Awakened general interest in fruit growing," by ten; "Admirable," by five; "Very good," by six; "Very excellent," by five; "Many have profited," by three; and other answers are "Wonderful and surprising," "Remarkable," "Aroused wonderful interest," "Made fruit growers sit up and take notice," etc., while one replies that "It has made a corpse walk and jump."

One correspondent objects to what has been and is being done in this direction, by saying that it is not the proper work of any State, or National Department, to do propaganda work in any particular industry. The reply to this objection is obvious, and that is that so long as the fruit trees of the State are threatened with extermination because of the failure to apply well known scientific treatment, or the State has thousands of acres of lands highly adapted to fruit growing, some Department of the State Government can well devote a small part of its revenue to disseminate this knowledge without laying itself open to the charge of paternalism. The fact that the Western states are shipping fine fruits into Pennsylvania, which have taken the place in all good markets of home grown fruits, should arouse a feeling of pride in our own natural advantages and abilities, and this I believe is being done.

Vice-President Eldon in the chair.

The Chairman.—You have heard the report of the General Fruit Committee. What is to be done with it?

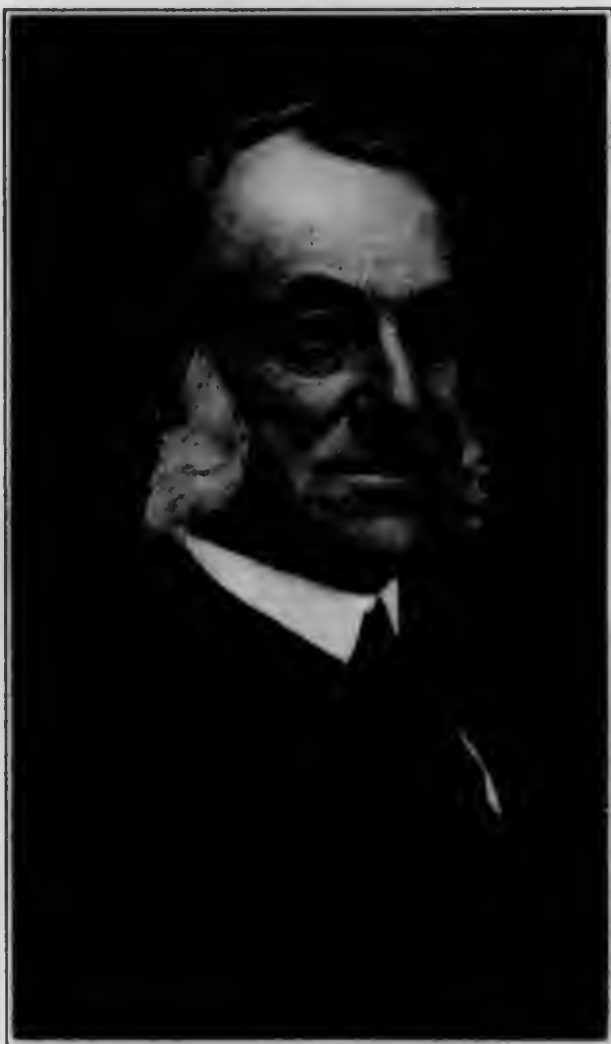
A Member.—I move it be accepted and entered on the Journal of the Association.

This motion was seconded, and carried.

THE VALUE OF THE PROPAGATION OF FRUIT
TREES FROM SPECIAL SELECTIONS WITH
REFERENCE TO CONSTITUTIONAL
VIGOR AND PRODUCTIVENESS.

BY GEORGE T. POWELL, *New York City.*

Mr. President, Ladies and Gentlemen: It certainly gives me great pleasure to again stand before a Pennsylvania audience. It was my privilege between 1897 and 1904 to meet with many audiences in your state, called for the discussion of agriculture. I



have attended some years every Farmers' Institute in your State, and have frequently spoken before your State Board of Agriculture. I remember on one occasion in speaking before the State Board of Agriculture on "Good Roads." When I finished, a member of the Board, who was a very intelligent old German farmer, got up and said he was much interested in what the gentleman from New York said on "Good Roads," but, he said, "I don't think much of what he said about brakes on wagons, because I think he is a ——— poor horse that cannot keep out of the way of a wagon in going down hill."

This afternoon I am to speak to you on the subject of Orcharding and the Propagation of Trees. I do not know of a more important

subject. We have been planting millions of fruit trees in the past few years, particularly of apple trees, and we are still planting apple and other fruit trees by the millions, and yet, never in the history of apple culture, have apples been so high as at the present time. We have seen a wonderful increase in the planting of fruit trees, and yet fruit is practically out of the reach of hundreds of thousands of our people who should have it. In 1896 the apple crop of the United States was something like 68,000,000 barrels, and we have never produced anything like it since. Our general yearly production runs from 23,000,000 to 45,000,000 barrels. Now, why is this so with all the extensive tree planting;

why is there not an increased yield all over the United States? I believe one reason is that we have not given as much thought to the propagation of our trees as we should.

I can take you through orchards in New York State, and show you numbers of trees there that produce very little, and some years nothing at all. They simply cumber the ground, and thus the propagation of fruit trees becomes one of the most important subjects before our growers to-day.

Now, why should there such a different in the production of trees? Simply because there is in all plant life the same variation in productivity that we find in animal life. Every farmer here this afternoon, who may be a live stock breeder, will understand that. In his breeding of animals he discovers much variation. It is very seldom that you can breed from the same stock a number of colts that, when grown, will be of the same type. It is seldom that you can breed along the dairy line, two heifers from the same stock that will give an equal yield in milk and butter. It is this law of variation that makes it so difficult to produce in animals anything like uniformity, and in fruit trees this same law of variation is at work, hence we do not get uniform results in our orchards.

Now, my suggestion is this: I believe it is possible for us to get more uniform results in our orchard practice, if we study the stock from which we take our scions. In nursery practice, seedling stocks are used, and then we take the buds from the young trees in the nursery and put them on these seedling stocks. What is the result? We are grafting on our trees scions that have simply a vegetative tendency. It takes the Northern Spy, in New York State from fifteen to twenty years to come into bearing. I can show you trees that have borne no fruit in twenty years, and I firmly believe that by exercising the principle of selection, we can produce a high quality of fruit in a much shorter time. We need to take our scions from the more mature trees. There are choice varieties of Spitzenberg, Jonathan, Grimes Golden—all very fine apples. Why don't we have more of them? Because they are not strong trees or vigorous bearers. The King of Tompkins County is another choice variety, but it does not produce well. It is not of vigorous stock, is subject to canker, and the tree will pass out very readily. In fifteen years you will have a very broken orchard of this variety. Now, I believe it is possible to grow the King and the Spitzenberg profitably. I think I have proved this fact.

It is something more than twenty years ago that I began to advocate taking our scions from the strong, vigorous, more mature trees. I advocated it at a Nurserymen's Convention, but not a member of that Association accepted my theory. They said they did not believe there was anything in it; that a bud was a bud, and would produce a tree. Now, that does not apply in stock breeding. We know of instances where men have paid a hundred thousand dollars for a stallion. Why? Because he was recognized as a most valuable animal, and his prepotency was known. Now, this same principle will apply in plant life, and starting on this plan, I began to work it out. I choose as my first experiment, the King,

because of its high value. I selected first the buds from an ideal King tree and top-worked Northern Spy trees; you know that tree is known and noted for its vigor. It has a good, strong root system, and when you can get roots that will go down deep into the soil and take strong hold there, you will have good and vigorous trees. It is twenty-one years ago since I started this experiment on my father's farm. He had planted the King trees, not one of which is now left, but in this orchard in which I experimented, we have trees that have been top-worked for twenty-one years; which show no evidence of canker, and are producing from seven to nine barrels of apples to the tree. Now, this is a wonderful record for the King; it is a fine fruit, but not a heavy yielder, and yet these trees show every evidence of going right on and being profitable for a half or three-quarters of a century more. Now, that is what I mean by our propagating stock with greater care. I might mention one or two others—the Talman Sweet (the wood is like steel), the Northern Spy, the Northwestern Greening—are the same, so fine grained is the wood, and so hard; you can use these safely to work the other varieties on them. I believe in this way we can increase the yield of apples in the United States at least fifty per cent. in the next twenty-five years, and produce fruit more abundantly than consumers ought to be able to have.

One other point. For a number of years, I produced among my trees large quantities of currants, but they were not satisfactory, and I began to investigate why the yield of this fruit should be so small, and I found that many of the largest appearing plants were not producing anything at all.

As the pickers came in one day, I discovered that a large number of trays came in with very little fruit from their rows, and then, again, other pickers came in with baskets filled in a very short time, heaped up with beautiful fruit, while it took the pickers in the thin rows a long time. I began to investigate, and found that in these thin rows bush after bush had no fruit upon them. They were large bushes, but had nothing whatever upon them. Many of the bushes were of this type—strong bushes, strong stem with perhaps only a single currant upon them, while side by side with them, were the bushes of this type—the bushes loaded from top to bottom.

These weak bushes were at once taken out and burned up, in order that we might not propagate from them longer, but propagate only from the strong bushes. Thus we began propagating our bushes from strong producing plants. As the result of this selection, we have increased our yield from an average of only one quart from a type of bush like this to an average of sixteen quarts from a bush of this type. This is a principle of sixteen to one that beats William Jennings Bryan's financial theory of 16 to 1 in silver and gold.

By studying the productivity of the plant you can propagate from the most productive plants, and increase your yield from fifty to five hundred per cent.

Now, when we begin to study the tree from this standpoint, there is not a grower who cannot, in a few years, build up an orchard that will be infinitely more profitable than it is to-day.

Gentlemen, one of the most important things to do in setting out a young orchard, is to study the trees in your neighborhood, or somewhere else until you find those that have a given record of thirty, forty or fifty years, and take your stock from them and put it on the Northern Spy, or the Greening, or the Talman Sweet, and you can increase your orchard yield very perceptibly.

Now, there is another very important matter, and that is the question of properly controlling the influences that interfere with the vitality of the tree. That is the question of diseases and insects. You can take the best bred tree, and reduce its ability to produce by repeated injury through the different types of insects. We have in our country gradually increasing numbers of insects, and they are producing a most deleterious effect upon our trees. Insects that are allowed year after year to denude the trees of their foliage, will in time so reduce their vitality and ruin their constitution, that we lose these important qualities in trees. My idea of spraying is that it is not only to destroy insects, but to increase the productivity of the tree; not only to maintain high quality of fruit, but to keep up the productivity of the tree. When you protect the tree from injury you preserve the source of future increase. Given a tree with strong vitality, strong constitutional vigor, and you can transmit to other trees, the properties that influence their production.

Another point raised on this subject was: At that convention the nurserymen said to me, we can't afford to grow trees on your plan; it costs too much. If we take the buds from mature trees they will fail to grow. That is true; buds from mature trees do not grow so well. "But," I said, "I would rather pay you a dollar for a tree grown after this fashion than take your trees grown from the nursery buds at fifteen cents apiece, because I can gain time by it." This point is disputed by some scientific men; they say it is a question whether you can get fruit quicker by bud selection. I have on my farm to-day some ten thousand trees many bearing fruit, and most of which were propagated along this line. I have produced Rhode Island Greenings from trees that have been top-worked with selected scions and which have produced half a bushel of apples to the tree at three years. Now, you all know that the Rhode Island Greening is not an early bearer. It is usually seven or eight years, sometimes longer, before it begins to produce, yet in three years from the time my trees have been top-worked, I can get from half a bushel to a bushel of apples to a tree.

During this season I have been able to make a record with the Wealthy apple. It is naturally an early bearer, and yet on my farm six years after the trees were planted and top-worked, we were able to show a profit of sixty dollars an acre. That is an unusual record. Let me say, in this connection, that in top-working it is of the utmost importance that the trees be kept in a growing condition especially where budding is done.

You cannot hope to meet with much success with what is known as the mulch system. You have to have thrifty, growing trees, otherwise the whole system will fail. You will understand

that I am an advocate of culture in the orchard, not of the mulch system. Now, this Wealthy orchard has been thoroughly cultivated from the time the trees were set out. During the year 1909 there was a very good setting of fruit, but the most of the fruit was taken off. Last year it came out with a magnificent bloom, and a fine setting of fruit. Then we went over the trees and had at least one-half of the fruit taken off. That was when the fruit was about one-quarter grown—about July 1st. Men and women were set to work again two weeks later, with instructions to take off anything between six or eight inches, no matter how perfect the fruit was. The result was that the fruit was very fine, and sold for \$4.50 a bushel, so that after deducting all expenses for freight, barrels, commission, etc., when the balance was struck that young orchard showed the profit of which I have spoken.



SIX-YEAR-OLD MCINTOSH TREES.

From special selection when propagated, some trees of which bore one barrel of apples each the first season—Orchard of George T. Powell.

Now, I believe that great value lies in propagating from perfect trees. You don't want one tree full, and the next half full, and on the next perhaps none at all. Through this method of propagation you may have every tree in your orchard giving you a satisfactory yield. There is no other way possible in which you can get uniformity in orchards, and a greater uniformity in bearing, except through his principle of selection of which I have spoken and advocate.

I believe it is possible to extend this principle to the propagation of peach trees. Why is it, that when we have frosty periods in the spring, that a portion of the crop—perhaps one-half—in the same localities, is not affected by the frost, and suffers no harm?

How can you explain the fact that in the same orchards some trees will come out unharmed? Here comes in this same principle of variation, and it applies not only to the productivity of the trees, but also to hardiness and resistance in trees. I believe it is possible to so develop trees that they will not only show greater productivity, but will have greater resistance to frost, and will come out unscathed. Such trees are to be discovered and to propagate from them, in time will enable us to produce trees that will be practically frost-resisting. Also we should study and propagate trees for resistance to disease. I sent a man over Central New York to find a King tree that had been bearing for thirty years, and had in that time shown no sign of disease, and when he found it, had him send me buds from that tree from which to top work my Northern Spy trees. By working in this manner I believe it is possible to produce a tree that is also practically disease resistant as not a trace of disease has yet appeared in this King orchard.

Now, I think I have made this point clear to you. Before I close, I want to give you an opportunity to ask me any questions which you care to.

Prof. Surface.—What age do you propagate the tree, and how do you do it?

Mr. Powell.—I set the tree, and top-work it the same season. If I set it in the spring, I bud it in the fall. I have changed my opinion somewhat in that respect. I used to take two-year-old trees, and top-work the following year.

Prof. Surface.—From what growth do you want the bud?

Mr. Powell.—I want a perfectly sound tree. For instance, apple trees usually make their growth from the middle of June to the middle of August, then I go through the orchard and select buds from the trees that show the best growth in that time. Choosing the buds that are strongest and best developed.

A Member.—You say the Northern Spy transmits vitality to the root it is grafted on?

Mr. Powell.—Yes. The Spy has a marked influence upon the roots of the stock upon which it is budded.

A Member.—Would it do it as well on its own root—as well as if it was grafted on?

Mr. Powell.—I think it might not affect its own roots the same. I was invited to meet the growers of the Ozark section of Missouri. In the discussion of this question there, one of the oldest growers and nurseryman, Colonel Evans, rose in the audience and said he thought he was the only man who knew anything about that, and then he related how he had arrived at his conclusion which was the

same as mine. He said that in that region when he came to plow out their blocks of rejected nursery trees, one mule could take out any variety except the Northern Spy; for that he had to take two mules, and he discovered that when stocks were budded with the spy buds, the roots became stronger, and it took two mules to plow them out. He then budded light growing varieties on the Spy stocks.

A Member.—Have you noticed any difference in the time of ripening in budding the different varieties on the same tree?



PICKING ADAMS COUNTY YORK IMPERIAL.
See Paper of Prof. R. L. Watts.

Mr. Powell.—No, I cannot say that I have, except possibly in the case where a very early variety was top-worked. My father had some Early Harvest trees, and I grafted them over with the Twenty Ounce apple, and I have been able to ship the Twenty Ounce apples a month earlier. I ship them to England, and by the one month's earlier shipment I have been able to realize quite higher prices.

Prof. Surface.—What early variety is strong enough to top-work?

Mr. Powell.—If I were going to use an early stock I would choose perhaps the Wealthy, upon which to work an early varieay.

Mr. Wickersham.—I was thinking that it is not, perhaps, so strong a grower.

Mr. Engle.—How about the Red Astrachan?

Mr. Powell.—Yes, it is a good grower of the Russian type.

A Member.—For, say, the McIntosh Red, what would you prefer as stock to work on?

Mr. Powell.—The Spy, or the Talman Sweet, or the Northwestern Greening. I would buy the best one-year trees to be had, and instead of planting in the orchard, I would plant in nursery rows because you can cultivate cheaper in this way. Then I would bud them the same season, and I would put the buds close to the ground. This gives the advantage of double working. You get this influence of the double working not only on the root, but on the top. I believe in a low-headed tree—I would not have the head more than two and a half or three feet from the ground. For the Rhode Island Greening I would put the head at about four feet.

A Member.—Why not allow the nurseries to do this work?

Mr. Powell.—That is a very practical question. In the first place, it is the business of nurseries to grow trees, and they will take better care of them than any farmer will. Now, if the nurserymen will do this, select the buds from fine mature trees, that would be the best thing to do. We will gladly pay them the extra price for the trouble. For the farmer or fruit grower to go into an orchard of five hundred or a thousand trees, and do this extra work requires considerable time. The work can be better done in the nursery. I believe that there is no better class of men than nurserymen, no more conscientious men who desire to grow good stock and trees true to name. There are mistakes made in regard to varieties.

A Member.—How about the agent?

Mr. Powell.—Well, beware of the man who goes round, showing the most beautiful pictures of trees, and has in his pockets labels of various kinds so that he can give you any variety that you want—at least so far as the label goes. Better buy direct from well-known responsible nurserymen.

A Member.—I believe that some of the orchardists do not care to furnish the buds.

Mr. Powell.—Well, I have no sympathy with that kind of a man. The wider a good thing can be disseminated the better for all.

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Dr. Mayer.—Would you not prefer root grafts, on the same principle that Kerr propagates the American plum on peach roots?

Mr. Powell.—I think it would be advisable if it can be done and the same results obtained. I have not used root-grafts. I prefer the whole root tree in its propagation.

A Member.—Will the budding of one variety upon another change its flavor, and to what extent?

Mr. Powell.—No, I think not. I think you cannot discover any change in flavor, grafted on the different varieties.

A Member.—How about color?

Mr. Powell.—No, I think that is not affected, either. That comes from the sun.

A Member.—If the soil, elevation and variety is the same, do you think there is a difference in the trees' resistance?

Mr. Powell.—Yes, I think there is. Individuality which is the result of the law of variation will be found under all conditions and we need to study, to observe and then to select.

A Member.—Will the matter of a change in a degree of latitude make any change in the propagation of the tree?

Mr. Powell.—No, I think not. I think those planted in the North will do very well for you here in Pennsylvania, and I would just as soon have trees grown in Pennsylvania, as those in my own state.

A Member.—What do you consider characteristic about the King?

Mr. Powell.—Its wood. When I prune my King trees it is simply play. On examination of the King tree, you will find that it is a soft wood, and hence, is not so resistant to disease; but when I prune the Spy, it is a very hard wood. It is like cutting through bars of steel.

A Member.—Does this propagation have any effect on the quality of the wood?

Mr. Powell.—Yes, I think it has, as the Spy affects the root, it may also influence the top and make the wood firmer, and harder, and more resistant to disease.

A Member.—One question: Does it matter where you put the bud?

Mr. Powell.—So long as you have the influence of the stock I think you have the benefit just the same if budded close down, or higher up on the body.

The Chairman.—We will now take up the next number on the program, which is "Blights and Cedar Rust on Apple," by Prof. H. R. Fulton, of State College. Two subjects have been assigned Mr. Fulton. He will read both papers, after which both will be open for discussion.

APPLE RUST.

BY PROF. H. R. FULTON, *State College, Pa.*

The fact that certain of the rust fungi attack two entirely different host plants during their complete life cycle, is strange enough to challenge perhaps immediate belief. One of the most notorious examples of this is the stem-rust of small grains, which has a second stage on the leaves of the European barberry, a rather uncommon plant with us. In New England, where it early became established, growers of wheat noted what was also noted in the Old World, that grain rusted most when growing near barberry bushes; and so the practical patriots of Massachusetts, some years before the colonies became a nation, passed a law requiring the destruction of barberry as a protection for their grain crops against rust. Unfortunately, this rust has the ability to bridge over from one grain crop to the next without the aid of barberry, largely through infection of the fall-sown grains and certain wild grasses. Actual proof of the relation of the stem rust to grain crops on the one hand and to barberry on the other was first made by a German botanist in 1864.

Two years later a Danish botanist followed up the clue furnished by horticulturists' traditions, that apple and other pomaceous plants contract orange rust from cedars; and proved experimentally that certain European species of rust do pass from cedars to apple and related plants, and vice versa.

For certain American forms of cedar rusts, Drs. Farlow, Thaxter and others have established the relationships to pomaceous plants, and we now know with the certainty that comes from rigid experimental proof that at least four distinct species of rust fungi, all belonging to the genus *Gymnosporangium*, and all passing a part of their lives on junipers, attack apple in the other stage of their existence causing the sometimes troublesome orange or cedar rust.

The three forms commonly occurring on red cedar in Pennsylvania are readily distinguishable. The most common (*Gymnosporangium macropus*) forms on cedar twigs slowly during twenty months the peculiar smotish, brown swellings as large as a marble known commonly as "cedar apples." In spring and early summer these send out in moist weather, bright orange, elongated, gelatinous horns; and then perish. Second species (*G. globosum*) also forms "cedar apples," but the galls are rough and scaly, and the long gela-

tinous horns are replaced by short protrusions of rusty red masses. These galls persist for several seasons. The third species (*G. clavipes*) attacks larger twigs and causes very slight swelling, but the bark is roughened, and through cracks there protrude reddish masses of spores; it is also perennial, and may attack the low, straggling common juniper as well as red cedar. At maturity, always in the spring months, the reddish or orange spores are produced for a single year in the case of *G. macropus*, for several years in the case



GYMNOSPORANGIUM MACROPUS.

1. Cedar-apple with gelatinous horns. 2. A spore from a gelatinous horn germinating and producing four infection spores, one of which is detached. (Very highly magnified). 3 and 4. Apple leaf and fruit with the cluster-cup stage of the fungus.

of the other two. With moderately warm weather and continuous moisture for 12 to 48 hours, these spores will germinate in the gelatinous masses, and give rise to a limited amount of growth, and produce within this period a number of smaller secondary spores. As the mass dries, these last become detached, and being exceedingly small and light, are easily carried long distances by the wind, as well

as by insects that feed on the masses. The gelatinous masses may swell and dry several times in April and May, as the showers come and go, giving rise to successive crops of secondary spores throughout a period of three or four, or perhaps six or eight weeks.

These secondary spores are short-lived, and to reproduce the fungus they must meet with suitable conditions of moisture, temperature and food supply within a very few days at most. The food supply must be leaves or the fruit, or possibly the young shoots, of some pomaceous plant, for *G. macropus*, it must be ordinarily apple, wild-crab apple or hawthorn; for *G. globosum*, apple, quince, mountain ash, or hawthorn; and for *G. clavipes*, apple, pear, quince, or junberry.

The fungous threads, on entering the apple tissues, develop slowly, and it is usually two weeks before the yellow spots are perceptible, and four to eight weeks or even more before they are completely developed. They are distinctly yellowish, early develop minute black dots on the upper side, later produce swelling of leaves toward the underside, and develop on the cushion thus formed a number of little cups with delicately fringed borders. Attack on fruit is near the flower end, the spots growing to be as large as a silver quarter; there is no swelling but the fungous threads grow deeply into the flesh producing a conical, firm, slightly discolored mass. Superficially the black dots occur near the center and cups may be formed at the margin. This stage on pomaceous plants is known as the "cluster-cup" stage, which is closely similar but not identical for the several rust species. A third type of spore is produced abundantly in these cups, and serves to carry infection back to the cedars in midsummer or later, to produce in turn galls that may not mature until as late as the spring after the next, thus bringing us back to the starting point. Unlike the grain rusts, these parasites seem to have no means of spreading directly from cedar to cedar or from apple to apple.

During 1910, in southern Pennsylvania, Maryland, Virginia and West Virginia, there was an abnormally severe outbreak of the cedar rust on apple. The explanation for this is to be found, no doubt, in moist spring weather conditions that greatly favored apple infection. In Center County, Pa., at least, the cedar apples and pustules matured and formed secondary infection spores several weeks earlier than usual, and their production extended over about twice the usual period. Furthermore, moist weather prevailed several days at a time when young apple leaves and fruit were developing, a condition that promotes the formation of secondary spores, and their germination after chancing to reach the apple. The rusts on cedars we have always with us; what the effect on apples will be in any season depends, in so far as we know, largely upon weather conditions.

I have tried to enlarge my limited observations for the past season by seeking information from apple growers in the four states named. The majority of these reports show that red cedars have grown very near badly infected orchards and there is abundant and striking circumstantial evidence of their relation to outbreaks.

Sometimes the cedar trees are reported at a distance of $\frac{1}{2}$ to 1 mile. This is no bar to their being a source of infection. Estimates indicate that a "cedar-apple" is capable of producing upwards of 30,000,000 infection spores; this would furnish 50 for every square foot of a 20-foot fence encircling the tree at a distance of one mile from it; and ordinarily an infected cedar tree produces quite a number of cedar apples. Of course the chances are against most of the infection spores being carried as far as a mile; but certainly many are carried farther by strong winds. The vast majority will chance not to lodge upon a proper host, and of those that do, many will perish in the absence of favorable conditions for germination. But there are enough infection spores formed to insure a certain number finally meeting with conditions suitable for growth.

More anomalous are cases of apples near cedars rusting less than those farther away. Three conditions might bring this about. The varieties growing nearer the cedars might be non-susceptible ones; winds prevailing at the proper time for transferring spores might carry them away from the nearer trees, and towards trees further away in another direction; and thirdly, the cedar trees that were in mind may not be infected with any of the three dangerous species of rust, while some unnoticed cedar nearer the infected apples might be the real source of the rust. For the rust species, although common, do not necessarily infest every cedar tree. In our class work in freshman botany, we have occasion to use a good many cedar apples annually, and we go to three or four lots of cedar trees where they may be had in greatest abundance; all of these have susceptible pomaceous plants growing near.

Two or three correspondents do not know of any cedar trees in their localities, and yet have the rust. If there is no confusion of other apple troubles with the rust, the question arises whether after all a close search might not reveal a few cedar trees that have passed unnoticed.

While some striking cases have been reported of prevailing spring winds carrying infection from cedars to apple, it must be remembered that an occasional blow from an unusual quarter, if at just the right time, may be more potent than days of wind when conditions are not suitable for infection. The question of how far spores may be carried in quantity, is the question of how far any dust-like particles may be carried, and depends upon the force of the wind, its upward or downward path, and the encountering of obstacles. A mile or two seems not at all impossible.

Removal of cedar trees near apple orchards has frequently given highly satisfactory results. The efficiency of this measure will be greatest when the cedars removed are the sole or main source of infection for this particular orchard. Wherever valuable though susceptible varieties of apples grow, cedar trees should be removed from the vicinity as completely as is practicable. Wild pomaceous plants, susceptible like the apple, may grow among the cedars and help to keep up a hotbed of infection ready to extend to neighboring orchards when conditions favor. Such pomaceous plants should be destroyed also. From reports and observations, I have tried to

tabulate a number of varieties according to rust susceptibility. In its preparation error may have come from necessary dependence on unaided memory; from the fact that different assortments of varieties will show differences in the relative rating of any given variety; from varying local chances of infection; from the biennial fruiting of some varieties; from the possibility that different ones of the three species of cedar rust have been involved in different localities; and possibly from differences in individual resistance within the variety.

For fruit infection the most susceptible varieties seem to be York Imperial, Fallawater, Rome Beauty, Smokehouse and Ben Davis. Less susceptible are Rambo, Smith's Cider, Red Doctor, York Stripe, Summer Queen, Bellflower and Winter Banana; while very slightly affected varieties are Jonathan, Stayman Winesap, Baldwin and Northern Spy.

Susceptibility of leaves to infection does not follow the same order. York Imperial seems to be undoubtedly most susceptible. Followed at a distance by Ben Davis, Wealthy, Newtown Pippin, Jonathan, Maiden Blush, Gano, Stayman Winesap and Grimes Golden in descending order of susceptibility. As to resistance sufficient to make the variety practically, if not absolutely immune, opinion must be somewhat more guarded. Grimes Golden is general choice for first place in resistance. In a second class come, curiously enough, York Imperial and Ben Davis, along with Black Twig. A less number mention York Stripe, Baldwin, Stayman Winesap, Northern Spy, Dominie, Porter and Strinetown Pippin.

The effect on yield is variously reported,—from nothing or very little, up to 80% in one case, and 90% in another; these figures being for some special tree or group of trees. When leaves are badly infected during a season, the manufacture by them of food for storage and bud formation is interfered with, and a shortage in the next season's crop from such trees is to be looked for. In some instances leaf attack has been severe enough to prevent proper maturing of the current crop, notably when rust attack was severe enough to cause early defoliation and consequent dwarfing of fruit on the trees. The quality of fruit directly attacked is greatly lowered. Many sold such apples for cider this last season; but with a strong market prevailing others disposed of theirs as No. 2's, or along with the general run of the orchard. Buyers seem not to have been as critical as they may be another season.

From the habits of the fungus, proper spraying ought to control cedar rust on apple. In practice, in closely watched experimental tests, the results from spraying have varied from success to failure. In the light of last year's experiences it seems that routine spraying for scab with Bordeaux, self-boiled lime-sulphur, commercial lime-sulphur and certain proprietary preparations is not a sure and reliable preventative of rust.

Cedar rust shows considerable seasonal variation in the time of infection spore production; and these spores are formed in several crops extending over a period of a month or two. If fungicidal spray applications are timed according to the frequent swelling

of the moistened spore masses, the treatment will prove costly, and cannot be carried out during periods of continuous moisture.

It is also difficult to apply promptly enough to be effective when the danger is greatest. Where such procedure has been most carefully tried, using Bordeaux mixture, the rust was diminished on the sprayed trees, but not satisfactorily controlled.

We ought to know whether apple leaves and fruit are susceptible equally at all stages of development, or whether the period of susceptibility is somewhat restricted. The constant occurrence of rust spots at the flower end of the fruit is suggestive; although this may simply mean that spores lodge here more securely and have more moisture for germination.

It may be that the disappointing results from spraying are due to the use of fungicides that are less effective against this fungus than against others; for we know that some fungi may be controlled by preparations that are ineffective for others. Several correspondents have noted some reduction in rust from the routine use of Bordeaux mixture or Pyrox; but I have received only one report of pronounced success. I wrote again asking for further information on several points, but in the absence of a reply, I simply quote from the first letter: "York Imperial yield is cut 90% the first 100 feet (from the red cedars); and about 75% the second 100 feet; and about 50% for the next 500 feet. We sprayed with lime-sulphur solution, Bordeaux, self-boiled lime-sulphur, and atomic sulphur. All the other sprays failed except atomic sulphur, which finished up a crop of very fancy York Imperial Apples worth ten dollars per tree within 100 feet of red cedars on my neighbor's land, where the unsprayed trees were not worth picking. Our observation is that no fungicide applied after May 15th will do any good toward controlling cedar rust." I simply pass on to you this bit of experience as it was reported to me, and leave you to judge its merits.

Serious outbreaks of cedar rust are sporadic and so have been the attempts to devise reliable methods of control. In the East and South and Middle West there is the constant possibility of an epidemic, and hardly a season passes without the report of serious loss from some apple growing district. We need to have at our command a knowledge of means of control that can be relied upon in such emergencies.

APPLE BLIGHTS.

BY PROF. H. R. FULTON.

It has been suggested that this Association might be interested in a discussion of apple blights; and by the plural form of the word I understand to be meant mainly the various forms of the bacterial blight, caused by *Bacillus amylovorus*, affecting the fruit spurs or new twig growth or the bark of larger limbs and trunk or possibly the crown region of the tree, and perhaps also two or three troubles,

caused by higher fungi, which may resemble bacterial blight superficially in their effects.

The story of bacterial blight is an old one with you, and I have little that is new to bring either from my own work or the work of others. We must keep constantly in mind the fundamental facts about this disease of apple and pear and quince. It is constantly present in most orchards. It is highly contagious. It is transferred largely by insects, and gains entrance through wounds, however slight, and exposed flower parts. It spreads rapidly and becomes



TWIG BLIGHT OF APPLE.

destructive when warm, moist weather conditions favor; this may be at the time of flowering, with destruction of flowers, and later of forming fruit, or it may be late in the season with little immediate damage. It spreads downward in twigs, fruitspurs and water sprouts, finally becoming established within the thick bark of large limbs; it may girdle these killing important parts of the tree; and it winters regularly in such cankers, thus starting new infection the following season.

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Blight can be kept out of orchards, but it requires systematic, persistent, thorough-going effort. Affected twigs and spurs must be looked for regularly and frequently at dangerous periods, and removed before the infection spreads to larger limbs, the removal of which would entail greater loss. Trees should be kept clear of useless water sprouts and on very susceptible varieties, fruit spurs had best be confined to smaller limbs. In cutting away affected twigs, limbs, and bark canker areas, care must be taken to include all possibly invaded material. In active lesions the bacteria push constantly forward into new regions, and always exist beyond the evidently dead portion. It is a good practice to cut twigs and limbs a foot below apparently affected parts if possible, remembering that if any part of the invaded tissue is left, the work has been for naught. The greatest difficulty is in dealing with cankers on larger limbs, and it is well worth while preventing their development by promptly removing affected twigs and spurs before infection extends to the parent limb. Sometimes these occur in crotches when it is hard to get at them; and always there is little chance to cut away much bark beyond the dead area. But all bark showing any discoloration inside must be cut away if the work is to be successful. In all of this removal work, disinfection of wounds and tools must be carried out. Wound disinfection is placed first because if wounds are clean cut their prompt disinfection will not only destroy bacteria immediately introduced from possibly infected tools, but will offer continued protection for some time to come. If a sponge or swab is carried, it is easy to touch every cut surface with the disinfectant, and to wipe the tools at frequent intervals. A number of antiseptic substances might be used; probably the best is corrosive sublimate in strength of 1 to 1000, or one ounce to seven or eight gallons of water. Of course, the larger wounds should afterwards be painted with thick lead and linseed oil paint. While it is a safe precaution to collect and burn all infected trash, it is far more important to get it removed from the trees than from the ground. The bacteria die quickly in pruned twigs, some tests made last summer indicating that four or five days is about as long as they can be expected to live in these under ordinary conditions, while on the trees they might continue active development for weeks or months.

In this general connection comes the matter of collar-rot, crown-rot or root-rot of apple trees. The exact nature and all the factors concerned in the development of such troubles, are not understood. It is likely that two or three distinct troubles affect the region of the tree in question. It may be that the blight organism itself plays a part at times, at least in extending the rot. The matter is under investigation, but the problem is a complex one, and work must be carried on for several seasons before definite conclusions can be reached. Meanwhile, I should like to know from you and others as much as possible about the occurrence of such trouble in the orchards of the State. For control, I would suggest the importance of guarding against the spread of possibly contagious material from tree to tree especially in worming. The use of 1 to

1000 corrosive sublimate solution on all wounds and tools is a reasonable precaution in such work. If the affected bark can be reached and cut away thoroughly at an early stage, so that there is a border of good live bark around the wound; and if the wound is disinfected with corrosive sublimate or lime-sulphur and painted with thick lead and oil paint or tar, so as to promote healing, the lives of some of the affected trees may possibly be saved. I realize the difficulty in most cases of reaching the underground parts satisfactorily and of applying these measures in advanced stages of the disease; but I do not believe it is worth while making an effort to check the spread and to prevent early girdling of the tree. In some cases bridge grafting may be resorted to advantageously.

Another thing to do is to give each affected tree every chance to make vigorous, thrifty growth, and as we say, to outgrow the trouble. The sooner the diseased condition is recognized, and these methods adopted, the better the chances for success. If the soil seems thin or packed, resort to judicious fertilization or cultivation. Guard against drouth conditions by adding humus or by mulching or by practicing shallow cultivation. Try to give the sick tree proper food and moisture and soil conditions. Check the natural tendency to over-bearing that comes from partial interference with the normal transportation of food from tops to roots; the tree will need as much building material as possible for the replacement of the diminished root system. Therefore, prune judiciously to retard top growth and to reduce a large leaf area that would make excessive demand for water upon the roots. Thin the fruit freely or remove it entirely. It is well worth losing a crop or two from an infected tree if the life of the tree can be saved thereby.

I would like to discuss the other bark and wood diseases found in our apple orchards, but time does not permit. In general, for all of them, the means of control are the prompt recognition of the disease and thorough destruction of affected parts, which serve as sources of further infection; and the disinfection of wounds, and along with these some missionary work to induce our neighbors to follow our example; and effort on the part of all to put out of existence the worthless wayside trees that so often carry over such pests from season to season.

A Member.—Does cedar rust have any effect on the growth of the wood?

Prof. Fulton.—Yes, it does sometimes affect the growth of young stock.

A Member.—Does it affect the apple?

Prof. Fulton.—Yes, sometimes; certain varieties, rather seriously.

A Member.—Does it spread from the leaves on the ground over to the apple trees?

Prof. Fulton.—No; the rust fungus in apple leaves that fall on the ground does not affect the trees; the way it works over is from the cedar branches. It develops slowly there during that winter, and also the following summer and winter. I did not make the point emphatic; but it does not spread from apple to apple, nor from cedar to cedar; it must come to the apple from the cedar, and to the cedar from the apple.

A Member.—Do you know any similar fungus that attacks the Yellow Locust?

Prof. Fulton.—No; I know of no fungus that attacks the Yellow Locust and the apple in common.

A Member.—Do you think that cutting out the apple trees affected with Collar Rot would decrease the percentage of loss in all the orchard?

Prof. Fulton.—No; my point is that the trees we are treating may, in the event they are attacked by collar rot, be a total loss in two or three years. By individual treatment they may live on, and in a few years again give us crops.

With reference to the cedar rust, or orange rust of apple which I spoke of first, it is a fungous growth, and it passes its life on the red cedar as well as on apple. The principal means to overcome it, so far as we know now, is the destruction of the red cedar near orchards. Our knowledge of spraying operations, at this time, is not sufficient to lay out any certain course of action. It attacks the fruit and the leaf, and sometimes the young shoots.

A Member.—Are there many cases of collar rot known to be in the orchards at the present time?

Prof. Fulton.—Not a large number of cases; but it is our business to see that slightly affected trees do not get into hopeless condition.

A Member.—Do you think there would be any danger of propagating it in young trees by taking scions from affected trees?

Prof. Fulton.—I cannot answer that definitely, but in a general way I can say that there is such a thing as individual as well as varietal resistance to disease. I would prefer to propagate my trees from strong trees, rather than from diseased trees.

Mr. Wickersham.—Would you advise planting a tree in the same hole in which there has been a diseased tree, and, if so, what treatment would you advise.

Prof. Fulton.—That is a point on which I have very little to say, because we don't know anything about it yet. We cannot say definitely what the effect would be.

Prof. Surface.—You very properly offered a word of caution about carrying diseases on implements used on trees. I would ask whether there is a possibility of Peach Yellows being carried by implements used on diseased peach trees?

Prof. Fulton.—There appears to be a good deal of contradictory evidence on hand on matters of this sort. In a general way it is thought that the Yellows is not carried from place to place on implements used. There is also a belief that this has taken place. I should like to know first what the Yellows is, and also what the conditions for its spread are. It is always wisest to be on the safe side, and to get the diseased trees out of the way.

A Member.—In case you have peach trees that you suspect have the Yellows, and you take them out, what special treatment would you recommend for the soil before planting another tree in that place?

Prof. Fulton.—It is usually supposed that the Yellows is not transmitted through the soil, and trees have been successfully planted without any special soil treatment.

Prof. Surface.—Mr. Chairman, I was very much impressed by the points brought out by Mr. Powell here, and in answer to an inquiry which I submitted to him, he gave one point which seems to me to be the most important point of the discussion. I may be mistaken in my views, but I think it is a matter of record in our minutes that I have advocated this same point, so that what Mr. Powell has done may be a matter of more or less value to us. You will notice that the excellent results he obtained from his currants were not obtained by propagating from either very young wood or very old wood, but from the individual bush. It is a matter of individual selection. We must recognize the fact that individual selection gave the results in his currant yield.

Now, he says, that he selects a well-developed bud for his tree in budding; he selects it at a period of the year when some of the buds are developed but others are not, and thus he gets his bud variation. We know that every bud has the possibility of becoming a tree just as soon as it is set in another tree. I am inclined to think that the success of Mr. Powell is not due so much to his propagating from old wood, as from advanced individual buds. I think we can recognize the fact that there is individuality in trees, just as there is in horses or men, or anything else. If we want a young-bearing tree, we can select our stock from a young bearing tree. I have a Winesap that bore last year, less than three years old, the only tree in the orchard that bore fruit. I believe if I propagate from that tree, and continue this kind of selection, I can produce a young-bearing strain. I believe that the principal point in propagation is to recognize the properties we wish to find, in the individual tree, and then propagate from that tree—take our scions from that individual tree. It is not so much a question of old wood,

or new wood, as it is of the individual properties we wish to select, which, however, are not made manifest in the fruit until the tree begins to bear.

I only wish we would carry out the excellent principle advocated by Mr. Powell in developing a tree that is resistant to disease, and to frost, and to fungous growths. Those of you who were at the meeting at Lancaster several years ago may recall that I made the statement there that I believed it possible to develop a disease-resistant tree, and asked for the names of varieties showing this tendency. Our President said that the person to name them was Mr. Surface himself. Then I had had no personal experience in practical tree development; I was simply trying to find out whether there was such a thing known to growers by their own experience.

I appreciate very highly the excellent talk of Mr. Powell and am glad to be allowed the opportunity to express my appreciation.

A YEAR'S WORK IN DEMONSTRATION ORCHARDS.

BY PROFESSOR H. A. SURFACE, *Harrisburg, Pa.*

Mr. President, Ladies and Gentlemen, Fellow Members of the Society: It should be very encouraging to us to see the progress along the lines of horticulture, because of the justifiably high rank that Eastern grown fruits, and especially Pennsylvania fruits, are taking. Tree planting has increased largely all over the State, not only in the commercial line, as shown by that magnificent exhibit over in the hall, but thousands of individual growers all over the State show a high rate of progress in many different counties. You and I know that a few years ago, we had dark days of discouragement. Planting in Pennsylvania was reduced to the lowest possible stage, for the discouragement was justifiable. The orchards in Pennsylvania were being destroyed by the San Jose scale, and by other pests. It was necessary to do something to eradicate them, and to do it quickly and thoroughly. Many and many a man was tearing out his trees by the roots in the belief that they were hopelessly affected. It was the duty of the Department of Agriculture, through the Division of Zoology, to try to overcome this. We commenced publishing bulletins telling the people how to spray. It was good, as far as it went, but it did not go far enough, so we were compelled to go out into the highways and by-ways and compel them to see. There were many persons who were willing to try it on their own responsibility, but many of them were so hopeless and discouraged that they did not even care to try. To overcome this, we had to go out and do the work ourselves, and risk our reputations on the result of the work. And when we did go out, it seemed, as one man said, that we were expected to take the worst and most dilapidated orchards and make them perfect specimens. You cannot do that any more than you can take an old, kicking bronco and make of him a lady's horse; but where we have had conditions that enabled us to do good work, we have had good results.

We have found that the lime-sulphur solution, and the arsenate of lead, will do all the necessary work, and you know, my friends, what a blessing it will be to horticulture to know without a doubt that the concentrated lime-sulphur and arsenate of lead is all that is necessary for a summer and a winter spray. I think the time is close at hand when we can say that the lime-sulphur and arsenate of lead will control all of the pests for which we have had to spray. This subject comes up later in the afternoon for further discussion, and I shall not further speak of it now.



In a few minutes there will be brought into this room, a map showing where the demonstration work has been carried on. The demand for demonstrations was such that we could not attend to it except in about one case out of a dozen. Then we arranged the Supervision Orchard Plan. We went to the orchard, met the owner, looked at the trees, pruned some and showed him how to make the concentrated lime-sulphur solution and apply it, prescribed treatment for the coming year and then left the work with him, helping him by correspondence, as at all times, with all persons who request

services by correspondence. We find, now, however, that we cannot even get to these Supervision orchards without dozens of people coming when they know the demonstrator is going to be there. We find no difficulty in getting an audience now, at any time or anywhere; often they number five or six hundred. I have a letter from a lawyer at Scranton, in which he says that when the demonstrator came there to supervise the spraying of his orchard, the weather was so bad that they only went out and looked the orchard over, and then came back to his greenhouse, where there were sixteen persons gathered to take instruction.

We find this getting into personal contact with the grower and showing him his needs, and the needs of each individual tree in his orchard—for each tree has an individuality of its own, just as every cow, or horse, or man has—is the best means of obtaining good results. It is hardly worth while for me to stand before you and tell you what results we are having, or *you* are having, because you are the people who get the results. I can point you to a dozen people in this audience who are getting better results this year, by these methods, than they ever saw before, on the same trees, but our cry is not so much "more fruit" as "better fruit."

The rush for tree planting has already passed beyond the experimental stage. One of our largest nurserymen told me recently that he had sold more nursery stock in Pennsylvania the past year than in any other state in the Union, and it seems to be the opinion of our nurserymen that this tree planting is increasing very rapidly. You ask, "what will be the result?" It will be a great deal of very good fruit, and a great deal of very poor fruit. There are still many people who imagine they can start an orchard, buy a tree and put it in the ground, leave it there without attention, and then get good results. Any man who does this will fail. He must be there on the spot, and he must know his trees and his subject. If he does not, he will fail, and he had better stop at once, before going into any extensive planting, which would mean greater losses.

In this same building, there is a general agricultural meeting now going on, at which the attendance is about one quarter what it is here. At the same time, stop and compare the profits you received from your fruit trees with those of the general farm crops on the rest of your farm. It is scarcely worth my while to give you figures but let me tell you that the attention of America is being turned to Pennsylvania, because of the magnificent fruit our people are growing—as fine as anything the West ever produced. In our fruits we can produce the size and color and we have also the quality, and we save over fifty cents per bushel in freight. I know of three men who are now selling their Western fruit lands to come to Pennsylvania to grow fruit. I have here a letter from a man who has sold his Oregon lands at \$2,000 an acre to come here for this purpose. We have all the possibilities of success. We have the climate; we have the soil to grow fruit; it simply takes modern methods to develop it. If the average Eastern man were to go West and attempt to grow fruit in the same slipshod manner that he does here, he would fail; and on the other hand, if the Western

man were to come here with his methods, he would be able to grow more and better fruit, without the expense of shipment. The chief effort of the latter would be directed toward more thorough pest control.

Seeing the danger of these pests, we commenced to spray with the lime-sulphur solution to control them. At first we had to consider it in the light of an experiment, because we did not then know whether it was right. The office of your Economic Zoologist was among the first to advocate it, and what is the result? You have heard it at this meeting. There are orchards in this State that were thoroughly infected with scale, but which are now absolutely free, and producing magnificent fruit. We are receiving letters from Kansas, Iowa, Texas, Virginia and Ohio, inquiring regarding the fruit lands of Pennsylvania, and in most of them they say they have been attracted to this state by our demonstration work. In this, as in other things, the pioneer must necessarily bear the blunt of blazing the trail.

(Map showing location of demonstration orchards shown here.)

In addition to this list of demonstration orchards, we have over eleven hundred farms as supervision orchards. We are gratified to learn of this success. I will call on two or three of my inspectors to take a few minutes of my time to tell you some of the results they find.

Taking some of the counties in order, we find in Adams, at Mr. Lupp's orchard, one year ago we had a few, a very few persons present at the demonstration meeting; this year we have received eighteen different requests from the town of Biglersville alone, asking us to undertake the supervision of their orchards.

Allegheny.—Oakdale Orchard Co., Major Nesbit: Some of these trees were cut back one-third, and Major Nesbit reports that the result last year was certainly fine.

Armstrong.—Rev. Mr. Kerr reports that the work of the demonstrators is serving as an inspiration, and they are waking up to the needs of tree pruning, fertilizing and cultivation. "This work has been of untold assistance to the citizens of Pennsylvania."

Berks.—One of my inspectors received this communication: "You no doubt remember that you conducted a public demonstration in my orchard, and you will perhaps remember how discouraged I was, and how you tried to encourage me by saying, you can easily save that orchard; if I only had one like it, I would be glad. Well, we have saved it; we have the scale under complete control. One of my neighbors told me I wasted more material than he used, but I told him I would save what he lost."

Here is the fundamental principle for success in spraying: Use the right material freely and strong enough and do thorough work.

A prominent Berks County grower writes us that if it had not been for the demonstration work, his trees would have had to be cut down, but the scale is now under complete control. He adds, "We cannot afford to give up this work."

Only recently I was in Ohio and I saw persons there cut down hundreds of trees because infected with scale. I am glad we are showing the people here how to save them, rather than cut them down.

In Bedford County we have some of the finest fruit in Pennsylvania. At the Pittsburg Land Show, the Jonathan apple grown by Brother Richards, received special attention and first award. His trees were once completely infected, but he sprayed with lime-sulphur, and now has the scale in full control.

From Bradford County I have a communication saying that the results of spraying were very satisfactory. Mr. Fred Bohlayer, of Troy, writes: "I suppose you will want to hear about the work done by the State in our Model Orchard. The results from the work done in the spring are certainly a surprise. While most of the orchards bloomed full in the spring, most of the blossoms dropped off, except those that were sprayed. In this part of the country there are scarcely any apples. In our own orchard, in which you gave the demonstration, I have about six hundred bushels. They are selling here at a dollar. There are scarcely any wormy ones, as I have no trouble with the worms."

We have found that the lime-sulphur is also a preventative of the blister mite, if applied while the trees are dormant.

As you get closer to this map, you will see that the white pins stand for the demonstration orchards, and the black pins for the supervision orchards, and there are one and a half times as many of the latter as of the former.

This letter of Mr. Bohlayer's, from Bradford County, also speaks of spraying the King apple. "The King trees rather looked as if they were going to die last year, but after spraying with the lime-sulphur, there was no trouble; we sent a box of these apples to the Land Show in Pittsburg, and if you are there, would like you to take a look at them."

Blair County.—I want to ask our friend, Mr. Kloss, what the results have been in his orchard?

Mr. Kloss.—I cannot tell you the full results, but I want to give you one or two examples. We have a number of Spitzenberg trees, two near the house, and the others over the orchard. We sprayed and pruned the two near the house, but did nothing to the others. Mrs. Kloss is the orchardist, and this is what she found: On the two trees that were dehorned (pruned) she got five bushels of first-class, and one of second-class apples, and on the others to which nothing was done, one bushel of first-class and five of second-class apples.

Prof. Surface.—In Carbon, which is a coal region, but in which some of the very finest fruit lands may be found, Mr. Gangaware writes, "The orchard seems to be in a flourishing condition; the work done by your men was greatly needed and highly appreciated. Let us hope that the next Legislature will provide funds for this demonstration work to continue."

From Chester County, likewise, we have had remarkable results. I should like Mr. Windle to tell us the results of the demonstration work over there.

Mr. Windle.—I don't think the results have been so remarkable, possibly, as some others, but they have been very satisfactory. I can say that at the County Home, the Spraying was handicapped in a great many ways, but they are highly pleased with the results. They never had much fruit over there. They cannot get fruit like at other places, because the inmates destroy the fruit, but Mr. Garrett is so pleased with the results that he advocates the lime-sulphur spray whether you have scale or not. There was another demonstration orchard, but no work was done there owing to the sickness of the owner at the time to demonstrate. We pruned and sprayed for the San Jose scale and the Codling Moth—one spraying to one tree, and yet the result has been conspicuous. The owner said he had never had such fruit as he had on those sprayed trees. That was Mr. Quinn, over in Brandywine Township.

Mr. McNeil also had good results, and it was announced in the papers. Mr. Alexander, a large commission dealer, had it cut out of the paper, and pasted beside it the report of a man in the Southwestern part of the state who had had no results and did not spray; and he added, "Go thou, and do likewise."

Prof. Surface.—I show you these two branches, the larger one killed by the San Jose scale, and the smaller one by the Oyster Shell scale. The latter is found chiefly in the mountainous regions of Pennsylvania, not in the Eastern or Southeastern portions.

Does Squire Loux have anything to say about Bucks County?

Mr. Loux.—The best recommendation, I think, is the number of supervision orchards that are asked for. We sprayed last year at the Farm School, and we have made good. We have succeeded in raising the grade every year in the apple orchard. We have a large orchard that was almost practically killed by the scale. We dehorned and sprayed it, and this year the crop was about half. I think the results indicated on the map there will show that we have made good.

Prof. Surface.—From Butler County we have a similar record.

Cambria County.—We had two demonstration orchards, one of which produced remarkable results, and the other did not. There are cases where the trees need something else besides spraying, something else besides pruning. Soil and climate have much to do with results, and then, again, we must not expect a hundred per cent. the first time we spray.

Center County.—Col. Reynolds sold \$20,000 worth of peaches from the orchard in which we gave the demonstration. There were quite a number of students from the College, as well as many other people there to meet my inspectors. In Mr. Brinton's orchard we sprayed one side of a tree; how about that tree?

Mr. Brinton.—There was three times the growth on that side of the tree that there was on the other.

Prof. Surface.—I want to say that I know no man whose knowledge of our methods is better than that of Mr. Brinton's.

Delaware County.—I have a letter from a very prominent citizen, at the demonstration in whose orchard I was present. He says "We have learned more about the Yellows than we have ever known, and I hope to profit by it so that I will never again have to take out half of my bearing trees, due to failure to take out a tree that looked healthy. The San Jose scale is now so scarce that it requires a search to find any, except on one tree. The apples are finer this year than last, and in the two years, besides having all the apples we could use and some to give away, we have sold enough to pay for our spraying apparatus and labor. We have good, healthy trees, all due to your advice. Your advice to spray, spray, spray is producing very good fruits, with very good prospects for the future, and for the life of our trees. We thank you. It is good to see the interest in the work that is starting in our neighborhood. The best of it is that every one who sees the results is getting a spray pump and using it."

In fact, we will undertake no demonstration work, or supervision work, until the owner will agree to get spray pump and use it.

If Dr. Cleveland is in the room, I wish he would tell us some of the results in his orchard of very young peach trees.

Dr. Cleveland.—They have grown until they have a caliper of nearly two and one-half inches.

Prof. Surface.—Every once in a while I receive a letter concerning our inspectors, and their thorough knowledge. From Delaware County comes a report like this: "Your inspector spent the afternoon in my orchard. He is faithful and earnest in his work, and I want to congratulate you on the character of the men you employ."

From Lawrence County I have a newspaper clipping headed "Johnson gets \$8,000 for his apple crop, and his brother gets \$6,000 for his apple crop." Rev. Mr. Johnson, of Newcastle, writes me that he is getting the best results from spraying, and says "I am delivering 42 bushels of apples per day at \$1.10"—making \$46.20 a day.

My time is getting short and I can not take time to mention details of results in all the counties, as I had intended, but I wish to say that the report from Lycoming County is to me of special interest and value. The writer, Mr. Wilson, says: "I wish to tell you of the results of spraying and demonstration. I have about 1,000 trees. In 1903 I had about 2,000 bushels of good apples; in 1904, about 1,000. In 1905, a buyer, a gentleman from your city came and looked over my cellar and said, 'I will take your Paradise,' but

refused all the others because of the condition they were in. [His crop was running down.] In 1906 and 1907 it was hardly worth the trouble of gathering. [He got down to the discouraged point.] In 1908 it was but little better." In 1909 he purchased a spray pump and commenced to spray under our supervision. The trees were sprayed twice, with Bordeaux and with lime-sulphur, and, he writes, "We had 1,500 bushels. Our mistake was in not spraying with arsenate of lead." This year he sprayed with it, and had 1,400 bushels of nice large apples, the finest his orchard has ever produced. "It is not that I want to take any honor in writing this," he writes, "but to express my appreciation to those of you who have been hammering away at us fellows, telling us what to do. A number of people are starting orchards in this and adjoining townships, and we are going to organize a Horticultural Society."

I have not taken the time to prepare a paper; the stress under which I have been working for the past few days is my excuse for this, and I trust you will pardon it.

In conclusion, as the result of this success, all we ask is that you give us your kind and cordial sympathy and co-operation, which we have had heretofore. The work that has been started is necessary for the continuation of your success. We aim to meet the needs of the people, and we invite your friendly criticism. We have the satisfaction of knowing that we have been of public service, and the gratification of receiving in return, the support and expressions of interest of our friends.

The President.—I want to say that this is a very gratifying report of the work being done by Prof. Surface's demonstrators. They must feel very much gratified at the success of their efforts, but we don't want them to get swelled heads over it; we want them to go right on and do better things next year.

TUESDAY, JANUARY 24, 7.30 P. M.

Vice-President Eldon in the Chair.

THE RELATION OF THE SOIL TO PLANT LIFE AND THE VALUE OF TILLAGE FOR ORCHARD DEVELOPMENT.

BY GEORGE T. POWELL.

Mr. Chairman, Ladies and Gentlemen: On the subject for discussion this evening, "The Relation of the Soil to Plant Life," practically depends the continuance of our entire work. As a nation, we have enjoyed for a period of perhaps two hundred years, the greatest prosperity. We have been the best fed nation in the world during this time, and have accumulated great wealth. In fact, we have, as a nation, accumulated in the last three centuries, greater

wealth than has England during two thousand years. How has this been accomplished? Simply because we have been given a soil richer than any other in the world, and we have been taking the wealth out of it and using it to build up our great nation. In the past three or four years, there has come over our nation a surprise in the unexpected and sudden rise in the cost of living. It has affected our entire population, especially that portion of it living in our large cities. The country has been drained of its population, and millions are congregated in cities, and we are now confronted with this problem of the cost of living, which has ranged upward from 30% to 300%. Now we are confronted with the problem of giving back to the soil the fertility which we have been taking out of it for more than two hundred years. We have been taking out and putting nothing back to replace the plant food that is necessary to retain the fertility of the soil. We are now to meet the problem of the depletion of our soil, while our yields per acre must be increased. In the past two centuries we have increased our yield of wheat per acre but two or three bushels; England has far exceeded us in that respect. In England, the average yield per acre is thirty-four bushels, while in this country it is but fourteen and a half. We have been increasing in population but nowhere have we correspondingly increased in production. As I said to-day, we find millions of people unable to eat apples, because of the exorbitant prices demanded for them.

Another point I wish to speak of, is the reckless destruction of our forest lands. We have swept across our great continent, and cut away our great forests until we have subjected our soil to the dryness that comes to a soil denuded of its trees. Not only is our soil becoming depleted, but there are places where our water supply is becoming exhausted. The last year has been remarkable for the depletion of our water supply. Many of our large cities, especially in the East, have been suffering as never before, for want of water. Towns and cities in New York were weeks without water supply in their houses and on their farms. We are now paying the penalty for the wholesale destruction, for soil depletion, and our forests, and it is necessary for us now to do something to restore this plant life and to renew the fertility of the land.

I desire to discuss this evening the relation of the soil to plant life, and what we may do to bring it up again. In the first place, we know the extent to which every tree, and every plant, and every flower that grows is dependent on the soil, for its life, hence the necessity of understanding that each year the ability to sustain plant life is lessening, and that unless something is done to replace this lost fertility, each year is lessening the supply, and increasing the cost of living to humanity.

I may say that the soil is nowhere near exhausted of its plant food even to-day. I don't believe that there is any danger of exhausting the soil anywhere in this country. We have millions of acres of depleted soil, but not one acre of exhausted soil in this country. The Great Creator was wise in his provisions for maintaining all life and he so placed them that it is practically impossible

to exhaust them. We have reached the stage where the soil is beginning to disown the people who have abused it, and that is why we see the cities crowded to-day. Many people who thought they owned their farms find that the injured soil has disowned them and driven them away because of the neglect that was shown it.

Now we want to consider how most economically fertility may be restored. There are methods which may be employed to build up needed plant food. Some of them are very simple. Away back in the sixteenth century there lived a man by the name of Jethro Tull. He was a great student of the soil, and he discovered that tillage was a very important factor. He thought he discovered that plants actually took up particles of soil as food. He was a student, and left a book in which he tells of the increased yield from tillage. He is the first writer on the subject of tillage. We know now that he was mistaken in his theory that plants take up particles of the soil, yet no man has done more for the improvement of the soil than did Jethro Tull, because he first discovered that by tillage we can increase production. Why? Because there is hidden away in the soil enough plant food still to meet the demands for centuries to come.

Next to the tillage comes another question of green crops. I want to apply this directly to the orchard this evening. In setting out an orchard, it is necessary to understand the soil, its character, type and quality. There are many orchards set out to-day on the wrong type of soil. I said this afternoon that there are millions of trees planted that are not producing fruit. One reason is that there are many trees planted on soil that is not suited to the production of the apple. That is one of the reasons so many trees planted add nothing to the increased production of fruit.

There on this chart are shown two distinct types of soil. On the right side you will see entirely distinct types of soils. It is of the oldest limestone formation; here you get the clay soil and the clay loams. On this side of the chart are the sandy types. This sandy type will almost always be found along the coast. Along the Atlantic coast, particularly, you will find it, and it is generally well adapted for market gardening; therefore, along the coast line from Maine to Florida we find the market gardens more than elsewhere.

As we go back from the coast we find the more mountainous country; here we have more of the limestone soil, and here is where we get our finest fruit. The old limestone is not in every part of our country. We find it in California, in Washington, in Oregon, then in Colorado, in Michigan, then on Lake Champlain, in New York, and along the Hudson River Valley, where you get this soil, you can grow trees and fruit as you can nowhere else. So it is important that when a man is first starting to invest money in the fruit business he should know something about the soil, so that he may make no mistake in his location.

Here on the chart is a form of soil known as "Hardpan." I remember a number of years ago in going over your state, I came across a small stretch of country where nothing seemed to flourish as it should; the farms did not show a prosperous appearance, the

trees and the woods looked stunted, the houses and barns were small, and the people themselves were poor and not prosperous. I found that the soil was made up of this type of hardpan. This hard sub-soil that comes up to say, within six inches of the top soil is very unfortunate for farming. You will find sections in the East and in the West, with this kind of soil. Impervious to water, it works like a cement floor, and is a very poor fruit soil. It is always either too wet or too dry, and can not be well tilled.

Then here is the very sandy soil, which is almost as bad for fruit. It is almost always dry; the moisture and the manure applied seeps through it in a short time, and leaves it dry and crops suffer for moisture.

Then, knowing our soil, we must begin the practice of right tillage and give to plants the conditions they need. Our finest soils are clay, or clay loams, but by tillage we can increase the productivity of all soils. The one principle of tillage is to make available the plant food that is in the soil. That is why clover is so difficult to grow to-day, because certain forms of plant life have been depleted and acid conditions have developed that are injurious to the growth of clover, which grew so luxuriantly in your state not so many years ago. In the last sixteen years, since I have been experimenting with clover, I have increased the productivity of my soil one hundred per cent, and I have spent but little for commercial fertilizers, although I am a believer in them. By tillage you can release the plant food that is still abundant in the soil, and set it to work to sustain and to make large crops.

In my orchard practice, on the farm that was owned by my great grandfather, who raised hay and corn and wheat; the same policy being followed by my grandfather and father when I began to farm, I found the orchards were not bearing as they should. I discovered that the plant food had become much depleted. If you will allow me a little of personal history—My father was a good farmer and a good business man, and he helped others in bank backing until one of these senseless panics came along and swept away his friends and his accumulations. When I inherited the farm of one hundred acres, I also inherited with it obligations of \$10,000. Most of you will think this was a pretty heavy burden for a young man just married. The first thing I did was to set about studying the soil and how to improve it, and I have never failed to pay one hundred cents on the dollar, and the farm today is better than it ever was, and covers at present nearly three hundred acres.

I believe that it is possible for most any one to take soil, and to begin without a dollar, and make it provide support. In order to do this, I believe it is only necessary to study the philosophy of tillage, and follow intelligent practice. What does the clover plant do for us? Every time we use the clover plant—especially if we use the Mammoth clover—it sends its roots down into the soil and loosens up the sub-soil and brings up the plant food that has never yet been touched. It brings up the phosphoric acid, and potash and adds to the soil nitrogen. The clover plant, like other legumes, such as cow peas and beans, have the power to take from the air

itself nitrogen, and help to build up the soil by adding to it the nitrogen that we know it needs. It is like a miracle, this building up of the soil by the legume plants. I have improved my soil principally by the use of clover, and it is a pleasure to go over my farm year after year and see the improvement that is taking place by means of the plant food that I am putting back into it. I remember a number of years ago when I first came to this state and advocated in your institute work the sowing of crimson clover, the fol-



LOW HEADED APPLE TREE—8 YEARS OLD.
Orchard of George T. Powell—Dwarfed by late summer pruning.

lowing year I was asked to go over portions of your state and make a special study of your buildings, your cattle, and your farms, in order to be able to discuss the subject even more effectively, and in going over the Pennsylvania Railroad through some beautiful sections of your state, here and there I saw fields dotted with crimson clover in sections where I had advocated it in the institutes. I knew there were the elements of fertility being added to the soil, and I never traveled anywhere with greater satisfaction than I did at that time when I saw the Crimson Clover that had been sown in the corn fields. I am firmly convinced that you can grow crimson clover in your state and thereby restore to the soil much of its lost

fertility. You have a wonderful power in your hands, and can use it to build up your soil, and add to it the nitrogen it wants, largely taken from the atmosphere.

Another important point in tillage is this: We must have moisture in the soil as well as plant food. I have recently made an examination of a large stretch of country in New Mexico that was opened to irrigation. I spent several weeks in studying the effect of water upon the arid lands of that state, and when coming back to my own farm, I found in the midst of a very dry season, just as beautiful apples, just as red and as fine as in that irrigated country of New Mexico, where they have to sink wells down 200 or more feet to obtain a supply of water. I found a beautiful crop of apples on my farm, because I had by tillage saved the moisture of the year before. I don't believe that we will ever have to spend a dollar for irrigation in the East. All we have to do is to save the water by tillage. As the season advances, the temperature rises, and becomes higher and higher on the surface; then there comes the pressure of the moisture in the soil, pressing upward to be evaporated. Now, how much moisture do you suppose one acre will take out of the soil in twenty-four hours? Every dry day in June, with the North wind blowing, every single acre of meadow grass will take up one hundred tons of water. What will a single large tree take up? It will require about six and one-half tons of water every twenty-four hours. Then, we must make a point of conserving this moisture, and that is done by the stirring and re-stirring of the soil until we hold back the water supply that is so abundant in this subsoil.

I made an experiment in peach culture a few years ago. In starting in at the beginning, I had followed the methods of the peach growers of Michigan. I began in this orchard the system of daily tillage, and continued it until those peaches were ripened and marketed. That season we did not have a rain fall of an inch from the time the peaches were one quarter grown until they were marketed. Every day that orchard was harrowed, one day in one direction, and the other in the next. While we were marketing the early ones, the harrowing was still going on for the later ones, and while the market was filled with peaches selling at fifty cents a basket, I did not sell a carrier for less than \$2.50. You may say that was expensive; so it was, but look at the returns from an acre of peaches at that price. It proved that we can successfully provide against drought by proper tillage and without irrigation.

A Member.—Did you roll it, or break it any?

Mr. Powell.—It was simply run over with a fine tooth harrow, and the finer we could make the surface soil the better we found it to be in holding the moisture below the soil—four inches down was moist all of the time. Now I want to show you in just a few minutes the results of some very effective work along this line and with clover culture.

A Member.—What effect would that have on "Hardpan?"

Mr. Powell.—Well, the "Hardpan" is so packed that you can not get the water through anywhere. "Hardpan" is a clay soil with no vegetable matter in it. It is of the nature of cement and very difficult to handle.

Here are just a few figures which will verify all I have said, and which I will explain to you: In one portion of a pear orchard were sown eighteen pounds of crimson clover to the acre. We cultivated the orchard up to about the 5th or 10th of July; then we sowed the crimson clover. That is for apple orchards.

In another portion of this orchard to the right, no clover was sown. At the end of three years, when we were introducing into the New York public schools lessons on the importance of teaching some of these things in the schools, I had some of the students visit my orchards, and with them was a chemist from Cornell, and he was so impressed with the soil that he requested me to send him samples of it for analysis, and this is what he found:

In the three years of the clover-treated land, the water contents showed 15% as against 8.75% on the land not put in clover. Nitrogen .20%, as against 12%, and humus 2.94% as against .94%. There is where the explanation comes in. The phosphorous was .015% as against .008%. 6.25% more available water from the clover-treated soil. That 46,000 tons per acre of water means a big thing to us in a dry season. He also found that I had added .09% of nitrogen, which equals 1350 pounds; of phosphorous .007% equal to 105 pounds.

A Member.—Any gain in potash?

Mr. Powell.—He made no analysis of the potash. He desired to find what effect the clover had in adding nitrogen and humus.

A Member.—Do you have any trouble in having crimson clover freeze in winter?

Mr. Powell.—It is true that crimson clover sometimes freezes in winter; therefore I advocate Mammoth clover with it. If you can get, as I do, from 20 to 26 inches of crimson clover before November, it does not matter whether it freezes or not, because we have the nitrogen and roots in the soil. After we have gone to the trouble of making this soil so fine and rich through clover and tillage we must protect it, or we will lose a great deal of the nitrates we have produced and set free. Put on rye, if nothing else, so as to keep it covered during the winter months.

A Member.—How much does the crimson clover grow in a corn field?

Mr. Powell.—I have had it 8 to 10 inches. Four-inch growth is well worth getting in corn.

A Member.—But not after the crop was harvested?

Mr. Powell.—No. The growth is slow until the corn is cut; after it is cut it will make a stronger growth. In the orchards the growth is much stronger.

Prof. Surface.—What is the height of your corn when the crimson clover is sown?

Mr. Powell.—About four feet high. We cultivate just as long as we can, and then the clover is sown just before the last cultivation, and after the corn is cut, then, of course, it covers the soil stronger.

A Member.—How much do you sow?

Mr. Powell.—Eighteen pounds to the acre, half crimson and half mammoth clover.

A Member.—When do you stop cultivation?

Mr. Powell.—About the 4th to the 10th of July in New York.

A Member.—Do you think you get better corn by using the clover?

Mr. Powell.—Yes; we think so. We think the corn gets some benefit from the clover.

A Member.—What is the best time to turn it in?

Mr. Powell.—I prefer to turn it in in the spring, because you have the winter protection then.

A Member.—When do you turn it in in the spring?

Mr. Powell.—Just as early as possible, because every day you leave it unturned, it is taking up moisture from the soil. If allowed to grow in the spring it will take out of the soil tons of water daily. We must prevent this by plowing in early.

A Member.—How do you cultivate with your apple trees headed so low as you said this afternoon?

Mr. Powell.—Well, I believe in clean tillage in the orchard; I believe in low-headed trees. We will have to change our entire philosophy of orcharding here in the East; we will never be able to overcome or meet the competition of the West as long as we have trees forty feet in the air. We will never control the San Jose Scale or the Codling Moth with trees thirty or forty feet high. My plan is not to prune trees until they are four or five years old, and then the pruning is on the top of the tree, cutting out the leading branches there.

Prof. Surface.—I thought you pruned it when you set the tree?

Mr. Powell.—I do; and then leave it alone for the next four or five years.

A Member.—How high do you make these trees?

Mr. Powell.—In setting out a two-year-old tree, if it has been top-worked and prepared in the nursery, I cut it so that it stands about four feet; should cut the main head of most varieties at three feet.

A Member.—How old are your trees when you stop cultivation of your orchard?

Mr. Powell.—I never stop cultivating. I have one orchard that my father planted seventy-two years ago, and it looks as if it were good for half a century more.



STATE COLLEGE STUDENTS AT WORK GATHERING TOMATOES.
See Address of Prof. R. L. Watts.

A Member.—How do you get up to the trees?

Mr. Powell.—We do not cultivate up to the trunks of the trees; it is not necessary. The roots next to the body of a tree are composed largely of brace roots. The feeding roots are out at the extremities, and there is where the cultivation is done.

A Member.—How do you cultivate it in the spring?

Mr. Powell.—We plow as close as we can; then put in the disks, and then we use the harrows, getting under the branches far enough.

A Member.—Don't the plow tear up a great many of the small roots?

Mr. Powell.—No, we have no trouble about that. They should be cut off if they don't know enough to keep out of the way. The fact is where you cultivate, the roots keep down out of the way. If you do not cultivate they will come to the surface.

A Member.—But don't they have a tendency to come to the surface, and cutting them do more harm than good?

Mr. Powell.—No, that is not the case. If they come up they should be cut off. They will go down always under regular cultivation.

A Member.—Is your ground fairly level?

Mr. Powell.—No; our land is fairly rolling, much the same as your land here. My ground is of the gravel loam type; we aim to keep it covered in the winter with a crop of clover or rye.

A Member.—Would a little root pruning hurt the tree?

Mr. Powell.—No; in fact, if you do a little root pruning with this intensive cultivation, it helps to keep the tree from running up too high.

Prof. Surface.—How about oats for a winter cover?

Mr. Powell.—They are all right; anything that will help the soil is all right. They will freeze down, but their roots will hold the soil. Rye is better.

A Member.—You spoke of top-working your trees?

Mr. Powell.—They are left in the nursery row for two years, top-worked and then set out.

Now a little more about this cultivation. I know of no orchard implements especially adapted to our Eastern conditions. They have them for the West, where they have the fine alluvial soil, but here in the East we have a different type of soil and I have been trying to get the manufacturers to put out a different implement—an extension plow, with a beam say fourteen to fifteen feet in length and on this put two or three small gang-plows—something that would cut in the centre of the spaces and partly under the branches. They have already something of this sort in Iowa, and I hope to give it a trial this spring. We don't want to cut a furrow with it; we only want to break up the soil so as to give it light surface cultivation.

A Member.—Is that the riding harrow?

Mr. Powell.—Yes, it has a seat for the driver.

A Member.—As I understand it, this is about 28" high; that would be too high for our trees.

Mr. Powell.—No; this is only about 16" high, and the plows are on the ends, and the wheels are inside near the center.

A Member.—Do you allow your trees to hang on the ground?

Mr. Powell.—That is an important question. I begin pruning for upward tendency to the lower branches. We have trees that are now nine years old pruned in this way, and they do not get on the ground. Trees that are pruned to spread out laterally will go down on the ground. The lower branches must have some pruning on the under side only and on ends when young; this will make strong branches near the body and hold up the branches.

A Member.—Will such a tree break?

Mr. Powell.—No, I think the lateral branches are apt to break. In my own experiments I began pruning on the under side, and I have branches today on trees eight and nine years old, as big as my arm, that do not break as the ordinary trees do, with the branches running out laterally. I wish you could see this pruning. Prof. Hederick of the Geneva Experiment Station says he thinks this the best pruning he has seen.

A Member.—Then you prune back?

Mr. Powell.—I have 108 trees to the acre, so I have to prune back. Of course, this is on the filler system, and when the time comes, they will have to come out. They may run ten to fifteen years on this system of filler planting.

There is one other point. We have overlooked the birds. They are our greatest friends, and I desire to show you the importance of protecting them. Take the family of wrens. I wish those of you who still have the wrens about your houses to raise their hands. I am glad to see so many. That means that you are way ahead of us in New York. I believe it is due to your very intelligent legislation that you still have so many wrens left. On Long Island there is an enormous cauliflower industry, and yet they have a great deal of trouble with the cabbage worm. One family of wrens around the place and in the garden, will keep one quarter of an acre of cauliflower absolutely clean of the cabbage worm. Now can you see how those birds help us. Protection to the birds is one of the great forces that we must co-operate with if we want to make our orchards more productive.

Then there is another friend—the toad. He comes out at night, and he is a good scavenger, and helps to keep the place clean of destructive insects. If he sees one he will follow it until he gets it.

In France they understand the value of this so well that they have resorted to toad farming. Parisian farmers go into the market

and buy them at 25 cents a box and put them into their gardens to keep down injurious insects. A scientific man in Boston has been making an investigation of the toad in connection with the Gypsy moth and the Brown-tail Moth. He found that the toads came out from under his porch every night and would sit under the arc light and catch the moths as they fell. He dissected one of them and found he had filled his stomach with moths four times in twelve hours. Now, there are thousands of people in New York and other large cities who don't fill their stomachs once in twenty-four hours.

PENNSYLVANIA HORTICULTURE.*

By PROF. R. L. WATTS, *State College, Pa.*

The following is a brief outline of the lecture delivered on this subject with views which were secured by the speaker as he had opportunity.



Pennsylvania horticulture may be best shown by contrasting with operations along horticultural lines in other states. Our state occupies a prominent place in practically all of the varied lines of commercial horticulture. Immense green houses have been built in recent years and the growing of vegetables as well as flowers is conducted on a much larger scale than a few years ago. The fruit industry has received a wonderful impetus during the past three or four years. Large areas are being planted to apples, peaches, plums and other fruits and there is every reason to believe that the development will be even greater. The pictures which you will see to-night will show that we are not behind other regions which are well known for their aggressiveness.

Starting in Ohio, we first want to give you some idea of the extensive work done in the greenhouses and gardens of M. L. Ruetenik. On this farm we find about two and three-fourths acres of glass devoted to the growing of lettuce, tomatoes and cucumbers.

*This lecture was fully illustrated with lantern slides and was largely descriptive of the illustrations. In preparing for printing, little more than an outline could be given.

The houses are large and provided with the Skinner system of irrigation so that the cost of operation has been reduced to a minimum. This overhead system of watering has also been installed for most of the work out of doors. It has revolutionized the work on this farm of eighteen acres where intensive methods have been used for many years. Manure is employed most freely. It is customary to apply horse manure from the livery stables at the rate of fifty tons per acre annually, both in the open and under glass. With such liberal application the returns have been large and satisfactory.

One of the best crops on the Ruetenik place is celery. The crop is grown on a large scale for marketing from late July until Christmas. All of the plants are started under glass, spraying at short intervals to control blight. For the early crop, plants are set in the open ground after danger of hard frosts. As soon as possible after planting, fresh manure from the livery stables is applied as a mulch between the rows at the rate indicated. It is customary to allow the manure to remain in small piles for a few days before applying. When used at the rate of fifty tons per acre the mulch is about five inches deep mid-way between the rows, sloping gradually to the plants. This mulch conserves moisture in the most effective way and also furnishes a liberal supply of plant food when the water is applied by means of the above ground system. This plan of culture has been signally successfully both with the early and late crop and it has been rapidly extended in the Cleveland district as well as in other parts of the United States.

Long Island has long been known as one of the most intensive market gardening sections of the United States. One eight-acre garden near Brooklyn gives steady employment during the summer to thirteen men. The most largely grown crops in this garden are beets, lettuce, radishes, carrots and other crops which may be planted close together. Ordinarily the rows of crops which are worked with wheel hoes are not more than ten inches apart. On most farms, however, twelve inches are allowed between rows. In the intensive gardens it is quite customary to start a second crop before the first crop has been removed. Manure is used with the greatest freedom and thorough tillage is given throughout the season. At the east end of Long Island is located Mr. L. H. Halleck, who is one of the most intensive market gardeners on the island. He cultivates 80 acres of land and gives employment to 40 or more men. The men are cared for in neat colony houses, coming together for their meals in a central boarding house which is managed by Mr. Halleck. There are few establishments in the country which are handled as skillfully as that of Mr. Halleck. Fertilizers and manures are used extensively on the Halleck farm. All supplies are brought to the farm by steam boats operated by Mr. Halleck and all vegetables are taken to market by means of the same boats. A full line of market gardening crops are grown at this place.

There are many operations about Boston to interest horticulturists. The work in New England is intensive and there are many

skillful growers. Manure is used with freedom and many growers also resort to the use of commercial fertilizers. A general line of garden crops are produced for the Boston market. The greenhouse industry is especially large near Boston. Lettuce, tomatoes and cucumbers are the most important crops. Probably no city in the United States grows more cucumbers than Boston. Nearly all of the greenhouses are 40 feet wide, of the three-fourths span of construction and many of them several hundred feet long. Cucumbers are also grown extensively as an early summer crop in cold frames as shown in the accompanying picture.

One of the most important trucking centers of the East is Sweedesboro, N. J.. Immense quantities of early tomatoes and sweet potatoes are shipped from this station. At Glassboro, N. J., are located the extensive orchards of Mr. Albert T. Repp. Four hundred and fifty acres are devoted to apples, pears, peaches and



CUCUMBER FRAMES IN THE GARDENS OF W. H. ALLEN, ARLINGTON, MASS.

grapes. The apple is the leading fruit in these orchards. Winesap has been most largely planted. The trees are pruned very lightly until they come into bearing. All of the spraying is done with gasoline engines. Ever since the appearance of San Jose scale in the Repp orchards, crude oil has been used with entire success in combatting it. Practically no trees have been lost from the effect of the scale or from injury of the oil. The secret of success of applying oil on Mr. Repp's trees is to put it on as finely as possible. It is applied in a very fine mist so that no large amount is permitted to collect in any one place. The spray is so exceedingly fine that two gallons of oil is sufficient to spray a tree that is twenty-five years old. Mr. Repp has his own storage house which is large enough to hold 10,000 barrels of fruit. The apples are placed in five-eighths bushel hampers in the field and covered with paper and placed at

once in storage. As a rule the apples are in cold storage an hour or less after picking. They are graded and repacked when shipped. Ordinarily the apples are held in storage until May or June.

The Patapsco Neck, near Baltimore, has long been known as one of the most important gardening regions in the United States. The fertility is maintained by manure which is taken to the farm on barges, and the use of commercial fertilizer. Cabbage and spinach are perhaps the two most important crops grown near Baltimore, although a large variety of vegetables are produced for Baltimore and northern cities.

The most important trucking district of the United States is at Norfolk. A visit to this district is necessary to gain a proper conception of the magnitude in which trucking is conducted in this region. Tomatoes, spinach, beans, peas, cucumbers and many



PACKING FINE ADAMS COUNTY APPLES.
(Mammoth Black Twig.)

other crops are grown by thousands of acres and by as intensive methods as is possible in truck farming. Fertilizers have been used with the greatest freedom in this community. It is not uncommon for a grower to apply one and one-half tons per acre each season. Some of the growers are free to admit that fertilizers have been used too freely, or rather that green crops have not been grown as largely as possible to keep the soil in the proper condition. The growers in this region have begun to use lime because they find it is necessary to reduce soil acidity. The use of lime has been the means of sweetening the soil and rendering it more useful to possibly all the crops grown in that region. The Norfolk Truck Ex-

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periment Station, of which Professor T. C. Johnson is director, has been exceedingly valuable in helping to solve the problems of the hundreds of producers in this locality. A number of frame growers operating near Norfolk have been realizing good profits. These men start and mature practically all their crops as beets, spinach, lettuce and cucumbers in frames. Overhead irrigation has been a great advantage on one of the places which has met with great success.

Leaving the South and coming back to Pennsylvania it is a pleasure to show a number of pictures of the splendid orchards in Adams county. This region is not only well known to the horticulturists of this state but it is known in many parts of the United States as a region which has been remarkably successful in the production of apples. Most of the pictures illustrate the spreading or open-head method of pruning or training. As is well known, York Imperial is the leading variety. Probably nine-tenths of the bearing trees in this county are of this variety. In most recent plantations, Stayman Winesap has been planted to a considerable extent and is doing well. Grimes Golden, Jonathan, Rome Beauty and a few summer varieties have been planted to some extent in the young orchards.

Kennett Square has long been known as one of the most prominent mushroom sections in the United States. Most of the mushroom rooms are grown in inexpensive houses, although a few more costly establishments have been built and have met with success. Mr. H. K. Hicks has, for example, erected a mammoth building with a double cellar in which he has been meeting with entire success. The greenhouse industry is also a paying proposition. Not only are roses, carnations and other flowers grown, but tomatoes are grown extensively for the Philadelphia market.

The last census report shows that Philadelphia County is fourth in the United States so far as yields and returns per acre are concerned. Some of the best and most intensive market gardening as well as truck farming may be found both north and south of the city. The farm of Thomas Brooks, Jr., is especially notable as being conducted in a thoroughly up-to-date manner. Practically no weeds can be found on this farm at any season of the year. The crops follow each other in quick succession and companion cropping is largely practiced on this farm. Stable manures are relied upon mainly for the supply of plant food. They are composted before using and then applied in large amounts. A great variety of crops, such as rhubarb, carrots, onions, celery, tomatoes, cabbage, lettuce, etc., are grown north of the city. South of the city the places are restricted mainly to crops that may be planted close together, permitting the use of intensive methods.

One of the best examples of intensive gardening may be found in Lancaster city. Ritchie Brothers have been cultivating vacant lots and meeting with entire success. Rotten manures are used more freely, perhaps, than in any other garden of the State and

sprinkling devices are also employed to control soil moisture conditions. Intercropping and succession cropping are used to a great extent.



SKINNER SYSTEM WITH CELERY ON THE FARM OF ROBERT J. WALTON.

Young Orchard in the Background.

One of the notable establishments near Harrisburg is that of Mr. Robert J. Walton, of Hummelstown. Fruit growing and market gardening on a considerable scale are carried on here and a thoroughly equipped and very satisfactory Skinner system is in operation.

Most of our horticulturists are familiar with the grape industry of Erie county. Hundreds of vineyards near Northeast have been returning to the owners satisfactory profits. Probably 95 per cent. of the plantings in this region are of Concord.

Many of the market gardeners and truck farmers which we have met during the past few years grow a large percentage of their own seed. This tendency is on the increase, not because dealers are selling poorer seed than formerly but because growers realize more fully the importance of growing and using the best seed. Some of the most successful growers in the United States have become plant breeders in a practical way, their seeds being produced by dealers who recognize the importance of furnishing their patrons with the very best seed. I regret that it has been impossible to show more views illustrating horticultural operations in different parts of Pennsylvania.

I am certain there are many people here to-night who are interested in the work of the Department of Horticulture at the Pennsylvania State College. Experiments are being conducted along various lines. In vegetable gardening, cabbage, tomatoes and asparagus are receiving the most attention. The aim of the Department

is to make a most thorough study of the most important questions relating to the culture of these three crops. All of these vegetables are of the greatest commercial importance to Pennsylvania. The strain tests with cabbage and tomatoes have been particularly valuable. The results indicate great variation in strains of the leading varieties of cabbage and tomatoes. In Early Jersey Wakefield for example, some strains have cut about \$100 more per acre than others. There have been marked differences in types and yields. An acre of experimental asparagus is giving most excellent results. Measurements and weighing show that it is exceedingly important for commercial growers to plant large crowns of plants rather than small ones. Palmetto seems to be the best variety to plant because of its power to resist disease and its vigor and productiveness.



RETAIL MARKET WAGON OF ROBERT J. WALTON, HUMMELSTOWN, PA., SHOWING AN INEXPENSIVE SHED FOR THE MIXING OF SPRAY MATERIALS.

The entire field of horticulture is covered by the various courses of study which are offered by the college. Most of the subjects are taught by lecture with accompanying laboratory exercises. Responsibility is placed upon the students as much as possible so that they will develop self reliance and attain the greatest possible efficiency in the management of crops under glass as well as in the open. In greenhouse work, for example, each student is assigned given areas on which he grows lettuce, tomatoes, cucumbers or perhaps flowers. He is held absolutely responsible for the plot, giving the care that may be required from day to day. On the college farm he is also assigned areas for garden work for which the student makes plans and then carries out his plans. In plant propagation the students are taught budding and grafting in a practical way. The root-grafts, for example are tied together in bunches with the student's name attached and he afterwards plants them in the nursery on the college farm. There are three distinct values to be

gained in conducting laboratory work in this manner. First, it creates enthusiasm. Second, it develops self reliance. Third, it gives the student an opportunity to become familiar with the practical operations in market gardening, vegetable forcing, floriculture and orchard management.



ONE OF THE GREENHOUSES AT STATE COLLEGE, SHOWING THE STUDENT PLOTS.

WEDNESDAY, JANUARY 25, 9 A. M.

President Heister in the Chair.

VEGETABLE FORCING UNDER GLASS.

By C. W. WAID, *New Carlisle, Ohio.*

Ladies and Gentlemen: Indeed, it gives me great pleasure to meet with you for the first time. Most of you are strangers to me, but I feel at home in spite of that fact, for two reasons, at least. In the first place, my father was born in this State, and in the second place, in meeting with the horticulturists in different parts of the country, we find that the problems they are trying to solve are the same, and it is easy to make friends if you are looking for them.

I find with you, as with us, that the subject of apples is most prominent, and probably to most of you, of the most interest. You have with you one of our most expert growers in Ohio, Mr. Farnsworth. He is a man whom we in Ohio, consider an authority because of the able way in which he produces a first-class fruit. You can bank on what he says being backed up by experience and success. I, myself, have eighty acres of orchard started, but not in

bearing as yet. But there are other products in the Horticultural line besides the growing of apples, and since coming here, I have learned that you are producing along the lines about which I am to speak to you, but I doubt whether most of you realize this opportunity as you should.

You talk about the Western man coming into the Eastern market and selling his apples. Do you know what the greenhouse men are doing to-day? Men in Massachusetts and in Ohio and in New Jersey are buying your coal and your glass and sending the lettuce back to your people and selling it, and making money on it, too, and good money at that. Is there no opportunity here for you? There are a good many in the business, but not nearly so many as could profitably engage in it, and I hope if you are not already interested, you will consider the subject with me this morning and become interested. I am confident that many of the young men under Professor Watts will take up this work and make a success of it, and vegetable forcing under glass will be one of the lines.

When I accepted the invitation of your Secretary to talk to you on this occasion, I told him that I make no pretense to being a public speaker. Unlike most of those who have preceded me, I am seldom able to get away for even this length of time, as our work is very confining. I realize that looking after the details of the business is where success usually comes. I will now take up my subject, and if there are any questions that I can answer, I shall be pleased to do so.

No doubt most of you are aware that vegetable forcing in Ohio has attained very large proportions during recent years. The places at which the greatest development has occurred are Ashtabula, Toledo and Cleveland. All located in the northern part of the state and not far removed from the lake. Besides the development at the places named, small or medium-sized plants have been built near or within easy shipping distances of most of the larger cities throughout the state. It would seem safe to say that at least one half of the present area of glass in Ohio has been built within the last ten years.

At Ashtabula there are less than a dozen plants all located within a mile of each other. These sets of houses cover over twenty acres of ground. At Toledo there are about one half dozen large plants and a large number of small greenhouses. The total area covered by glass and devoted to vegetables is probably somewhat greater than that at Ashtabula. The largest plant in the state is that owned and operated by the Searles Brothers, at Toledo, and consists of a set of old houses covering three acres and a new plant which was planned to cover ten acres, two acres of which is yet to be built. This eight-acre greenhouse plant is all under one roof. The service room alone would be considered a good-sized greenhouse by many growers.

At Cleveland there are a very large number of houses, many of which covers one-fourth acre or more. Mr. M. L. Ruetenik's plant which covers about three acres is the largest. The total area would probably not be over one-half that at Toledo. There are only a

few small greenhouses in or near Cincinnati. This is probably due to the fact that growers there have depended on hot beds and cold frames and have not as yet become much interested in the construction of greenhouses.

Style of Houses.

The style of houses in use varies considerably although the narrow span is most popular. Most of the large plants at Toledo and Ashtabula are made up of sets of narrow span houses, the width being about 15 feet and the length varying from 100 to 750 feet. The Crane Bros. of Toledo have both narrow and wide houses. The wide houses are 45 to 50 feet in width and about 350 feet in length. They are individual houses, having been built separately and are giving satisfaction. This style of houses has a decided advantage over the connected houses in a section where the snowfall is heavy. It takes a comparatively short time for the snow to slide off of a roof which has no gutter while a much longer time is required to melt the snow out of gutters of connected houses. Our own houses are 32 by 200 feet and connected. We find that the snow clears from the outside slopes much quicker than from the inside.

So far as results are concerned we find good crops growing in narrow and wide houses, connected and disconnected houses, in houses running north and south and east and west. It would seem from this that the style of house has little to do with the quality of the crop grown. This is assuming that all of the construction is good. Light, clean houses are always superior to dark, dirty houses. The style of house which we select will depend on our own individual preference, the comparative cost and apparent durability. We usually find more or less similarity in construction in each community. This shows the tendency to "Go and do—like-wise."

It is the opinion of the writer, although I must admit that I have no data to support my statement, that wide houses can be heated more economically than narrow houses. It would also seem that when tender crops such as cucumbers and tomatoes are grown in midwinter that the danger from draughts would be much less in wide than in narrow houses.

Heating.

At Ashtabula and Cleveland nearly all of the houses are heated by steam. At Toledo hot water is the popular method of heating. Anyone who thinks hot water not practicable for large plants should visit Searles Brothers' eight acre plant. The water is pumped through the system. The heating pipes as I remember are all 1 1/4 inch pipes. They are run in sets near the surface of the ground, one set under each gutter. The houses are 750 feet long and the heating pipes half that length. In our own houses in which there are 20,000 sq. feet of glass we heat with hot water. The boiler is a Kroeschell with a mercury generator attached. The heating pipes

are two-inch, one flow and two return in each set. For houses the size of ours or smaller there is no doubt but that hot water is the most economical method of heating. It would take a careful set of experiments conducted over a long period of time to determine whether steam or hot water is most economical for large plants.

Glazing.

The most popular size of glass is the 16 by 24 double strength A. glass. B. glass is used in a few instances and a very few growers use single strength. In most cases the 16 by 24 glass is laid the 16 inch way. The glass on our own houses is laid the 24 inch way. This gives a very light house and has been quite satisfactory. Once last winter when we had an unusually heavy snow and drifts formed to a depth of from 3 to 4 feet in the gutters, several glasses were cracked. It would seem from this experience that it would not be wise to space the glass the wide way in a section of the country where heavy snows are common. If the glass is spaced the 24 inch way it is advisable to have some glass, either in the sides of the house or in the roof of a small house spaced the narrow way. This should be done so that use can be made of the panes of glass from which small corners are broken.

There is quite a difference of opinion as to whether butted or lapped glass is to be preferred. As a general thing there is less drip from lapped than from butted glass. On the other hand butted glass is more secure than lapped as the lap holds it in place. Butted glass is usually easier to keep in repair than lapped.

Soil and Soil Treatment.

The soil at Ashtabula is very sandy while that at Cleveland and Toledo is a sandy loam. It might seem from this that sand is necessary in the vegetable forcing business. This is not the case, however, as it has been demonstrated by the Experiment Station and several growers throughout the state that heavy soils will give results equal to sandy soils. In any case large amounts of organic matter should be added to the soil. I would as soon have clay loam as sand for the basis of the soil for forcing. The soil in our greenhouses was made up of two parts clay loam, which contained a fair amount of organic matter and available plant food, one part muck and one part stable manure. It will be necessary, no doubt, to add more muck from time to time in order to keep the soil mellow and in a good physical condition.

It is only in rare instances that soils are renewed in vegetable forcing houses. Several years ago I saw a crop of lettuce growing in soil which had been in continuous use for thirty years and the crop I saw was a very good one. So far as I know this soil is still in the houses. In most cases the greenhouse soil is kept in a productive state by the addition of large quantities of well rotted stable manure which is spaded into the soil just previous to the planting of each crop. The Ohio Experiment Station and a few growers in

the state have for several years followed another plan of renewing the soil fertility. Briefly the plan is as follows: As soon as the tomato or cucumber vines are removed from the houses, about August fifteenth, a heavy coat of manure is spread upon the soil. Water is applied at frequent intervals, once or twice a week, and in sufficient quantity to leach the fertility out of the manure into the soil. Just before the first crop is planted the coarser part of the manure is removed and the finer worked into the soil. No more manure is added to the soil until the tomato or cucumber crop is to occupy the ground when well rotted manure is worked into the soil or coarser manure applied as a mulch. Thus two or three crops of lettuce are grown with but one application of manure. This is the plan we follow and we have found it very satisfactory.

As a general thing little or no commercial fertilizer is used in vegetable forcing houses. Tests which were conducted by the Ohio Station demonstrated that commercial fertilizers can be used to supply the plant food in greenhouse soils but it is necessary to supplement them with some form of organic matter. Manure or muck being suitable for this purpose. When stable manure which has not been exposed to the weather can be secured in sufficient quantity without too great an outlay there is little use made of commercial fertilizers for greenhouse work. There is need, however, of further investigation by our Experiment Stations and others to determine when and in what quantities commercial fertilizers can be used to advantage in vegetable forcing houses.

Lime has been used with good results in some cases. We save all of the ashes which result from the burning of the tobacco stems and work them into the soil.

Soil sterilization has been found necessary in many of the commercial houses. Steam has given best results although formalin has been used successfully in some cases. The outfit for sterilizing with steam should consist of a steam boiler with connections to perforated pipes buried in the soil to be treated. The soil is not moved from the beds or benches but treated where it is in use. The steam is forced into the pipes under pressure and the pipes are not removed or moved until the soil is literally cooked. Where sub-irrigation is used the steam is turned into the tile for sterilizing the soil. Some of the Ashtabula growers use muck in which to start the seedling plants. The muck is placed in a box through which perforated pipes are run, the steam turned on and the soil sterilized before it is used. This treatment kills all disease germs and weed seeds and thus renders it ideal for a plant bed. On heavy soils it is necessary to allow the soil to stand untouched at least one week and two weeks is better after sterilizing, before any planting is done.

To sterilize with formalin use $1\frac{1}{2}$ to 2 quarts of formaldehyde to fifty gallons of water applying one gallon of the solution to each square foot of surface. This solution may be applied through the overhead watering system if such a system is in use. Formalin has given fairly good results as a means of overcoming the disease known as Lettuce Rozette but is not effective in controlling lettuce rot.



INTENSIVE METHODS IN NEW CARLISLE, OHIO GREENHOUSES—
THREE CROPS OF LETTUCE IN ONE BED.

Crops Grown.

The general practice in Ohio is to grow three crops of lettuce followed by one of cucumbers or tomatoes. This is varied somewhat by different growers and different years. Tomatoes are grown as a fall crop in a few cases. A very few growers force cucumbers in the fall. Radishes, beans, cauliflower, beets, parsley, etc. are all grown more or less. In a few instances chrysanthemums are forced instead of lettuce in the fall.

Lettuce.

Grand Rapids lettuce is grown almost exclusively in Ohio. One of the difficulties which confronts the grower right at the start is that pure seed is hard to get at any price. I have yet to see a crop grown from seed purchased from a seedhouse that did not show some tendency to revert to the coarse dark colored type. The Ohio Station has secured seed by selection which is very nearly pure. This shows that it is possible to produce pure seeds and the growers should let the seedsmen know that they want pure seed and are willing to pay for it. It is not necessary, however, to depend on the seedsmen for lettuce seed as it can be grown quite easily and the greenhouse who secures satisfactory strain by purchase or by selection should grow his own seed.

At Ashtabula the seeds are sown in solid beds which have been covered to a depth of four to six inches with sterilized muck. The seeds are covered with moist brown paper. As soon as the plants are large enough to handle they are pricked out in other muck

filled beds being spaced about two inches apart each way. The root development of the plants in this soil is remarkable. The plants are allowed to grow to a height of three or four inches when they are removed and transplanted in the permanent beds.

The Toledo growers use flats in which to sow the seed and grow the young plants. These flats are about one and one-half by two feet in size and the bottoms are made of closely woven galvanized wire. One of the chief advantages of the flat method over the ground bed is that the flats may be carried to where the planting is done and the plants removed and set with much more dirt in contact with the roots than is usually the case where the plants are removed from the beds, carried some distance and handled a second time before they are set. There is however, a large amount of work connected with the handling of the flats which offsets much of the gain. Another advantage of the flats is that the roots are more or less confined, the soil being shallow in the flats, and thus overgrown plants are less frequent with flat grown than with bench grown plants. If it were possible to set the plants every time just as soon as they were large enough this advantage would be slight but it is frequently necessary to hold them several days after they are of sufficient size and the flat grown plants can be held with less danger of injury than those grown in beds. The Toledo growers do not let their plants grow as large as the Ashtabula growers before setting in the permanent beds.

In our own houses we start the lettuce in flats and make one transplanting into flats. The first crop is not transplanted but once until it is transplanted from the flats to the beds. For the second and third crops the seed is sown in flats, the seedlings pricked out in flats and as soon as crowding begins the plants are transplanted into two-inch pots or into flats and given more room. When the pots are used they are plunged into the soil between the rows of lettuce, twice as many pots as there are plants in a row. In this way we are able to secure very stocky plants which when planted by the side of those which have not been transplanted the second time show a gain of two or three weeks over the smaller plants. This gain in time we think justifies the extra work involved. By setting the pots between the plants in the beds we have two crops growing on the same ground at one time and thus economize room. When the plants are plunged in the sub-irrigated beds we give the soil a thorough watering as soon as the pots are in place and little or no further watering is needed as a sufficient amount of moisture is drawn into the pots from below. The same is true of the beds watered with the Skinner system. I would not recommend this practice, however, where the watering is done with a hose in the old fashion way.

When the plants are set in the permanent beds they are spaced 7 by 7 inches which we think a very satisfactory distance. The soil between the plants is stirred once or twice with hand weeder. This is done to kill weeds and to prevent the formation of a crust on the surface of the soil. If the green aphid is troublesome we scatter tobacco dust over the surface of the soil just before the leaves

spread enough to cover the ground. Much care is taken in distributing it not to get the dust on the lettuce leaves as it is very hard to wash off after it has been on the leaves for some time. It is also a good plan to work some of the dust into the surface of the soil before planting.

Most growers aim to keep a night temperature of 45 degrees with a day temperature at least 10 degrees higher. We aim to run the temperature somewhat higher than this at night, 48 to 50 being what I consider about right. On cloudy days we do not try to run the temperature above 60 and 55 degrees is satisfactory. When the sun shines the temperature often runs very much above this but no harm will result if the ventilators are opened wide. Ventilating the houses is one of the most important operations connected with greenhouse work and I might add that it is the one most commonly neglected. Our houses are provided with ventilators on both sides of the ridge and on the sides and we make use of all of them. It is only on very cold, zero or below, weather or snowy days that we keep the ventilators closed in the day time. When the nights are warm we leave them up an inch or so all night. If I were to give the cheapest and surest way to prevent lettuce rot in the greenhouse I would say use elbow grease on the ventilators.

Packing and Marketing Lettuce.

The Ashtabula growers pack all of their lettuce in splint baskets, four pounds to a basket. The Cleveland growers sell in the local market and pack in bushel crates. The Toledo growers pack in large sized barrels. We are able to procure barrels at a low cost and as our market is close we can pack in barrels and place on the market in good condition. We ship by traction and sell through commission men. If we were to sell to grocerymen direct we would pack in a five or ten pound box or basket.

The important thing in packing is to put in nothing but clean marketable lettuce and have it alike throughout the package. Do not leave long stems, dead or rotten leaves on the plants.

The Ashtabula growers are most of them organized into an Association, called "The Ashtabula Lettuce Growers' Association." Mr. E. A. Dunbar is General Sales Manager and looks after the selling of the combined produce of the members of the Association. This does away with the competition and resulting cutting of prices among the growers themselves which I have been informed was quite common before the organization was formed. It also enables the growers to give more time to the growing of their crops as they do not need to devote any time to the selling of them.

Growers who are located near a good market have a decided advantage over those who ship long distances. They are able to place the lettuce on the market in a fresher condition and thus can get one or two cents more per pound for it. They are not compelled to pay as much expressage and are often able to cut out one or more middlemen.

Cucumbers.

At least 75 per cent. of the total area of glass for vegetable forcing in Ohio is devoted to cucumbers in the spring and early summer. The White Spine is grown more than any other kind. Seeds are planted in pots or in solid beds about four weeks before the plants are to be set in the permanent beds. The time of setting varies with different growers and different seasons and extends from March first to the middle of April. Cucumbers are more particular than lettuce as to treatment and must be handled with much more care. The temperature should not be allowed to go below 65 and 70 is better. Daily ventilation should be given but cold draughts should be avoided. When started in pots care should be taken not to overwater, on the other hand the plants should not suffer for lack of water. Cucumbers should be given all of the room in the beds as the plants grow so fast that other crops do not have time to mature before the cucumbers occupy the space. Seedling plants grown in flats may be placed between the cucumber hills for a short time but should not be left too long.

The soil for cucumbers should be supplied with an abundance of available plant food either by applying manure to the soil or by mulching after the cucumbers are set. The spacing of the plants varies more for cucumbers than for any other greenhouse crop. When the inverted V shaped trellis is used upon which to train the vines the rows are set from eight to sixteen feet apart, and in a few cases even wider, and the plants from 6 to 18 inches apart in the rows. When the vines are trained upright the plants are set from two to three feet apart each way. When the vines are trained on an inclined or V shaped trellis the cucumbers hang below and are easy to gather. The chief objection to this form of training is the unequal distribution of the roots in the soil. Our practice is to set the plants two feet apart each way, one plant in a place, and train the vines straight up. This gives a very even distribution of foliage and roots as well. While I have only meager data at hand, some tests made at the Ohio Station a few years ago indicated that the largest yield per square foot is secured when the cucumbers are planted two by two feet rather than much wider apart one way and closer the other.

Nearly all growers practice removing all laterals or side runners. Some cut them off next to the main vine while others clip them just beyond the first female blossom. The last method gives the most fruits in my judgment. Bees are nearly always kept in the houses during blooming time to assist in the pollinating of the flowers.

As soon as the cucumbers are large enough, picking begins. After the first week or two we pick three times a week. The cucumbers are graded into first, seconds and culls. The second grade runs smaller than the first but the specimens must be of good color and not too irregular. No effort is made to sell the culls.

The Ashtabula, Cleveland and Toledo growers use the same package for cucumbers that they do for lettuce. We have found



MANURE IS USED EXTENSIVELY IN NORTH PHILADELPHIA.
See Address of Prof. R. L. Watts.

the 24-quart berry crates a very satisfactory package to ship in. They must be nailed securely and the slats removed from the tops. Some of the Toledo growers turn the hose on the cucumbers after they are in the barrels. We have always avoided wetting them using a cloth or gloves to clean when sandy or in need of cleaning.

Cucumbers have the advantage over tomatoes of coming into bearing earlier or sooner after they are set in the beds. There is usually less work connected with the growing of cucumbers than tomatoes but the tomato crop is surer. The comparative net profits depends on the prices at which both crops sell.

Tomatoes.

As I am scheduled to treat the subject of tomatoes this P. M. I will only refer to this important greenhouse crop in a general way at this time. The tomato is a very satisfactory crop to force in greenhouses for spring and early summer markets. The quality of greenhouse tomatoes is so superior to anything on the market early in the season that when the trade has once learned to know the difference the demand is nearly always good. The crop is dependable, also, thus serious loss is seldom experienced.

Radishes.

It is only occasionally that radishes are forced as they are generally considered less profitable than lettuce. We grew radishes the last two seasons and while the returns were not as good as from lettuce at good prices yet they were better than from lettuce at low prices. One crop gave a net return of 8½ cents per square foot

which is about the same as 8 cents per pound for lettuce. Our method of growing them was different from that usually followed. Instead of thinning the plants so that each radish would have plenty of room to develop we left the plant quite thick in the rows, from one-half to three-fourths of an inch apart. As soon as a few of the radishes were large enough for market they were pulled and this answered the purpose of thinning. In a few days another pulling was made and so on until all had developed and were pulled. This gave us a much larger yield per square foot than we could have secured any other way although the time required to grow the crop was somewhat longer than it would have been if the plants had been thinned out more at the start. The varieties used were Fireball and Scarlet Globe. We also grew some Icicle but they will not stand crowding as well as the button varieties.

An oversupply of lettuce is not an uncommon thing in the early fall. In order to avoid this it is well to devote some of the space to other crops at that time of the year. Radishes, string beans, cauliflower and beets are all suited to this purpose.

The writer does not know how well the markets are supplied with greenhouse products in your state, but if there are any cities of 10,000 or more population which are not supplied locally with these crops each one is offering someone an opportunity to make a good living. No one should start in the greenhouse business, however, on a large scale without having had some previous experience along that line. Vegetable forcing under glass is most exacting and requires the closest attention to details of any form of gardening. On the other hand there are few lines of work which will show the effects of a master hand more quickly and fully or give more genuine satisfaction to the man who likes that kind of work than vegetable forcing under glass.

The President.—The speaker will be at your service now, to answer any questions you may want to ask.

A Member.—Is the dry manure preferable to the fresh stable manure?

Mr. Waid.—It is hard to get fresh stable manure.

The President.—Is it as readily available as the dry?

Mr. Waid.—There is a large amount of available plant food in it, sufficient, I think, to supply the needs of the plant, but not as much as in dry manure.

Prof. Watts.—Does the muck soil prove better than the sandy soil?

Mr. Waid.—I am satisfied that the plant development is better in the muck, than in the sandy soil, but I think a mixture of the sand with the muck is better.



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Mr. Waid.—I am satisfied that the plant development is better in the muck, than in the sandy soil, but I think a mixture of the sand with the muck is better.

Prof. Watts.—Are the advantages sufficient to make it advisable to have the muck soil shipped for that purpose?

Mr. Waid.—That would depend upon the expense. I would not go to a great deal of expense.

A Member.—Are these the solid beds that we have heard about?

Mr. Waid.—Yes, sir, I do not refer to the florist's work at all.

The President.—Where muck is not available, would rotted sods take its place?

Mr. Waid.—So far as the greenhouse work is concerned, it would be all right, but I do not think it would do for vegetable forcing under glass.

The President.—What is the difference?

Mr. Waid.—It is more of a physical than a chemical difference.

A Member.—When and how often do you sterilize your soil?

Mr. Waid.—We never sterilize; we have never had occasion to, where the summer mulch has been practiced. Where we do sterilize the soil, we do it at least once a year; sometimes it is done more frequently, but at least once a year.

A Member.—When is that done, in the spring or fall?

Mr. Waid.—In the fall, between the last crops and the ones put in in the fall.

A Member.—Has there been any use of the Hydrocyanic Gas fumigator?

Mr. Waid.—Not to my knowledge. It has been done in the case of the white fly.

A Member.—Have you any trouble with that?

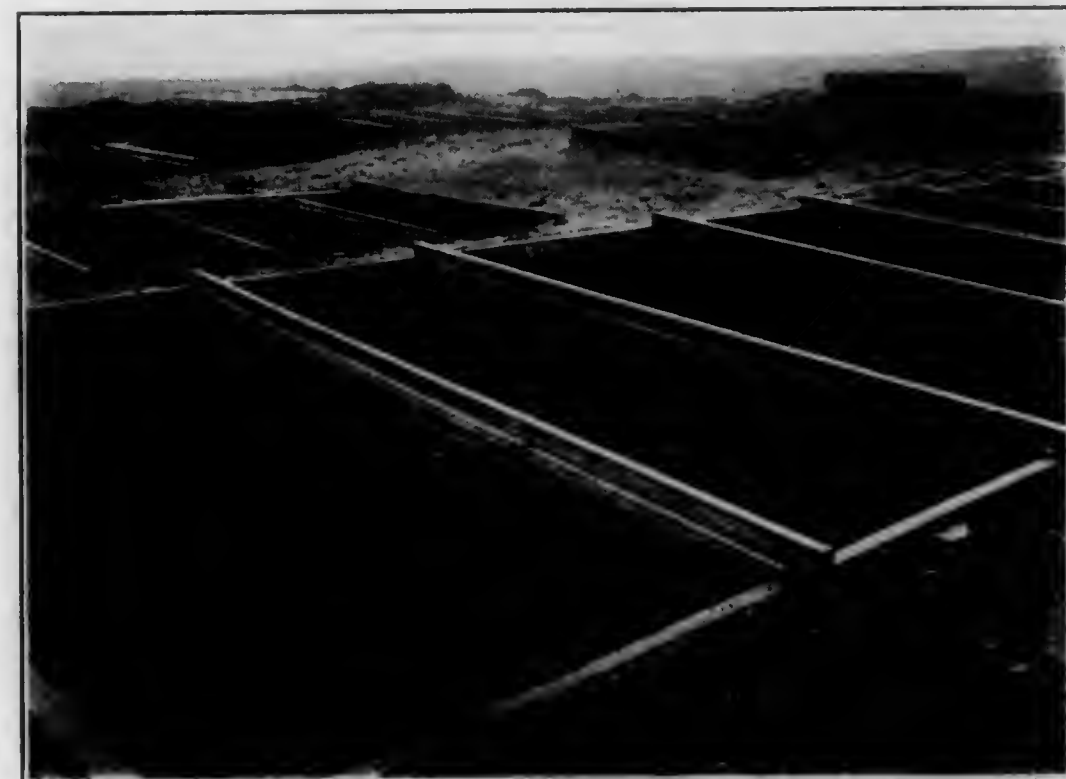
Mr. Waid.—It is a very troublesome pest where it becomes established, in the growing of the tomato and cucumber; it does not bother the lettuce very much.

THE MUSKMELON.

By PROF. J. W. GREGG, *State College, Pa.*

Mr. President: It affords me peculiar pleasure to be present at a meeting of this Association and have the privilege of addressing you upon a subject dealing with a crop that to many minds is the garden's unequalled delicacy.

Writers tell us that the muskmelon has been grown as an article of food from a very early date, and that from the hotter parts of the Orient it has been introduced all over the world until to-day it is a favorite in many home gardens as well as of great commercial importance in many sections of this country. At the mere mention of the name we immediately think of New Jersey, the Delaware Peninsula, Maryland, Ohio and the districts around Rocky Ford, Colo. We think of these sections as affording ideal soil and climatic conditions, of their methods as the best and of their growers as thoroughly up-to-date as the light of modern science will permit. However true this may be, the fact remains that we are usually very much disappointed in the fruit from these sections as it reaches our markets and tables, and we are rapidly recognizing the high-quality of home-grown melons whenever they are to be found on our markets.



STARTING MUSKMELONS IN HOTBEDS.
Courtesy of C. G. Woodbury, Lafayette, Ind.

We find that comparatively few melons are raised in Pennsylvania and that our larger markets are being supplied almost wholly by the sections previously mentioned, while merchants in many of our smaller towns and villages do not pretend to handle them at all, thereby depriving a large rural population of a most delicious and healthful food. This condition should not be so, because by continuous breeding together with the varying soil and climatic conditions of this country the melon has become adapted to a wide range of territory and is capable of being grown in larger numbers in Pennsylvania. I presume, however, that the low status of melon growing here in this state may be due to three causes, first, lack of knowledge regarding culture. Second, the tendency to late maturity, and third, improper selection of varieties. Many

have failed or obtained only partial success because the requirements of the crop have not been thoroughly understood. Soil, seed, planting, cultivating, harvesting, marketing, insect pests and diseases are all factors that spell success or failure in proportion to the amount of knowledge and proper practice of each.

It is not my purpose this morning to lay down any specific rules that will guarantee a crop of melons, but rather to consider somewhat broadly perhaps the vital points of melon growing in Pennsylvania with the hope that some suggestions may be offered that will lead to a more general production of this highly desirable article of food.

While we usually recognize a sandy loam as best adapted to melon growing, it is a fact that heavier soils containing a considerable amount of clay, if well drained, well located and supplied with humus and plant food will grow good melons. I would select if possible a piece of land that has a good slope to the South in preference to land on the lower levels, because the former is more quickly warmed up in the Spring, natural drainage of the soil is usually better and there is good air drainage. Such land should be brought into as high a state of fertility for melons as for any other crop. Soil capable of growing a good clover sod may be considered in good condition for melons in fact, it is recommended to plow down a clover sod in the fall and in the spring make an application of yard manure at the rate of 10 or 15 tons per acre. The fall plowing should be deep and the working of the soil with a disc or cutaway in the spring should be most thorough in order to completely incorporate the manure with the soil and to make the soil open, loose and fine and capable of holding large amounts of moisture for the future needs of the plants. The melon is usually considered a shallow rooted plant and for this reason soils in the past have not been worked very deep, but it has been my experience that a deeper root system is encouraged by a deeper working of the soil and this means stronger and healthier plants and a better crop in every respect. The melon plant when well grown has an extensive root system, as well as a large vine and leaf surface, and it takes a large amount of plant food to support this growth. We do not need to worry about getting the soil too rich for melons providing the plant food is well balanced. I mean by this that if clover sod is plowed down and heavy applications of manure have been made we will need to use phosphoric acid and potash in sufficient amounts to balance up the nitrogen that has been added to the soil by the clover and manure, otherwise the plants are liable to produce too much vine growth at a sacrifice of fruit. I believe many plants blight or become weak and stunted in growth late in the season because of the lack of sufficient plant food to hold the plant up during the period of fruit production. Chemical fertilizers have not been used successfully in the Colorado districts but I believe here with our heavier soils they may be used to advantage and the sources of supply for the different elements should be chosen with reference to a gradual availability in order that the plant may be kept growing throughout the season.

It is impossible to recommend a fertilizer that will suit all conditions. Each man will have to work out his own fertilizer problem and apply in amounts to suit the needs of the crop in his soil. A fertilizer that has been found satisfactory in many cases consists of four per cent. nitrogen, eight per cent. phosphoric acid and ten per cent. potash applied at the rate of 800 to 1500 pounds per acre. It has always been my practice to apply the phosphoric acid and potash and a little of the nitrogen broadcast and thoroughly work it into the soil with the harrow and save most of the nitrate of soda to be used as a top dressing to start the plants off after they have produced their first true leaves or after they have become established if transplanted from a cold frame. Some growers on a small scale especially prepare each hill using two or three forkfuls of manure in the bottom and covering with about four inches of soil in which the seed is sown, but the general practice is now to prepare all the soil evenly and thoroughly.

After the soil has been put in good condition the seed may be safely sown about the 15th of May and by the time the young plants are through the ground all danger of frost will be past and the nights will be getting warmer. I do not believe anything is gained by planting seed too early in cold, wet soil. The seed germinates slowly and the plants are often stunted by cold nights and show the effect throughout the season. There are two methods of planting with varying distances for each. Seed is often sown in hills, the common distances being six by six to facilitate cultivation in both directions. The larger growers, however, are now planting in hillrows ranging from seven to nine feet apart and sowing enough seed so the plants may be thinned to stand two or three feet apart in the row. This system requires more hand cultivation but has the advantage of allowing two rows of early peas to be grown between each row of melons before the melons need the space. Care should be taken not to plant the seeds too deep. An inch and a half is deep enough in light soils, while an inch is better with our heavier soils.

By sowing seeds in hotbeds and transplanting to the field it is possible to gain one or two weeks in the ripening season. Great care and attention is necessary, however, to grow the plants strong and healthy in the frames and in transplanting them to the open ground. The melon is a plant that does not like to have its root system disturbed and as a result, careless planting often checks the plant to such an extent that it is a fit subject for disease or insects and if it succeeds in living at all it shows the effect of the check throughout the season.

After the plants are up, or immediately after transplanting, they should receive constant cultivation to check all weeds and to conserve moisture. Shallow cultivation should be kept up until the growth of the vines prevent. Hand weeding and hoeing must often be resorted to to keep weeds from occupying the space needed by the melon vines.

After sowing the seed or transplanting the young seedlings from the hotbed to the open ground we must be prepared to fight insects and disease. The striped cucumber beetle is probably the

worst enemy of the plant during its first stages of growth. Various remedies have been used and recommended but probably the most valuable of all is Bordeaux mixture as its presence on plants is distasteful to the beetles especially if some poison like Paris Green or arsenate of lead is added. Bordeaux mixture at 4-4-50 strength with one-half pound of Paris Green or two pounds of arsenate of lead will effectively control the beetle.

The one objection to this mixture, however, seems to be that it should not be used until the plants begin to vine as it has a tendency to check the growth of young plants. Tobacco dust with powdered arsenate of lead added forms a very reliable repellent up to the time the Bordeaux can be used. It is a question with me just how many beetles die from the effect of the poison, probably a few but to my mind this mixture does more to keep them away than to kill and they are expert at dodging sprayed or dusted plants. For this reason, trap plants may be left untreated for them to feed on until this period of danger is past. Clean culture in the fall also serves to destroy winter hiding places for the beetles.



STARTING MUSKMELONS IN HOTBEDS.
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The melon aphid is the other serious pest that must be fought. It is advisable to watch the young plants closely and pull up and burn if only a few plants are attacked. These insects are somewhat difficult to combat as they work on the under side of the leaves and must be killed by a contact spray. A ten per cent. solution of kerosene emulsion sprayed on the under side of the leaves with good force will successfully control the aphid, but the great difficulty seems to be in hitting all of them and they must be hit to be killed.

Rust is the worst fungous disease of the melon and a great deal of attention is being paid to the breeding of a rust resistant

variety. At the present time a variety known as Pollock seems to be showing up quite well along this line. All experiments, however, tend to show that this disease can be successfully controlled by spraying with Bordeaux mixture (4-4-50 or 4-5-50). The first spraying may be made as the plants begin to vine and other applications made as growth takes place in order to keep all new growth covered with the bordeaux. The rust is the worst in hot, wet seasons.

There are many varieties of melons differing in earliness, color of flesh, shape and size. The green fleshed varieties are firmer than the salmon fleshed varieties and should be grown on the warmer, lighter soils and for long distance shipping. While the orange fleshed varieties are much richer in flavor, as a rule, but become over ripe and soft, quickly when grown on light, warm soils, they are perfect melons in every respect when grown in a cool location. While it is claimed that some markets are particular in their demands for certain varieties, I find that if the flavor is present it does not matter what the size is or whether it is a green or salmon fleshed variety. Of the green fleshed varieties, Netted Gem, Long Island Beauty and Pollock, are probably the leading ones, while Emerald Gem, Hoodoo and Millers Cream lead the salmon fleshed varieties. I thank you.

Mr. Engle.—What is the difference between muskmelon and cantaloupe?

Prof. Gregg.—That is the same old question. Most of the varieties we are growing in this state are muskmelons. The cantaloupe is supposed to be more of a European product; we very seldom see the true cantaloupe grown in this country. On the old, true cantaloupe, the rind is hard and rough. They have not the appearance of our netted muskmelons, and as grown in some sections lack flavor. They are grown freely in many of the older sections of the world, but as I understand it, they are not often found in this country.

Mr. Engle.—Is the Casaba coming in from California a muskmelon or a cantaloupe?

Prof. Gregg.—It is of the cantaloupe type.

A Member.—Is it true that old seed is better than new seed?

Prof. Gregg.—I don't think so. Mr. Waid, what do you know about it?

Mr. Waid.—No, I don't think it is.

A Member.—Do you think it advisable to take a bucket with tobacco or kerosene emulsion in it, and dip the leaves and vines in it?

Prof. Gregg.—That has been done but would be slow and expensive on a large scale.

Mr. Engle.—Your method of combating the striped beetle is a surprise to me. You say nothing about covering the plant with gauze; this method is used by many of our growers here.

Prof. Gregg.—It has been done; the only objection is that it takes so much gauze, and so much time, and it does not last two years. You have to buy new material every year.

Mr. Fox.—You spoke of spraying with Bordeaux mixture; would it not be injurious to the plant to use the Bluestone as strong as 4-4?

Prof. Gregg.—Some injury has resulted in some sections, but it is a good formula.

A Member.—What causes the crackiness in the melon?

Prof. Gregg.—Too rapid growth, and sometimes too hot, rainy weather just before the period of ripening.

A Member.—Do you apply your Bordeaux for the beetle immediately after the plant comes up, or do you wait until it has got a start?

Prof. Gregg.—Sometimes the plant coming through the ground is checked by the application of Bordeaux, but I know men who begin to spray immediately after the vines come through the ground.

A Member.—My experience has been that the beebe will attack the young plant and keep right on with its work.

Prof. Gregg.—Yes, that is so, and the method of keeping the stem covered by dry earth will help to prevent that.

A member.—My experience has been that using phosphoric acid, or a strong antiseptic, such as creolin or carbolic acid, will help to overcome them.

Prof. Gregg.—Yes; or a mixture of sawdust and kerosene will do. They do not like anything with a disagreeable odor, and also dislike any covering.

The President.—I am glad we had this subject on the program this morning, for the reason that Harrisburg pays thousands of dollars every year for muskmelons shipped in from the South and from California, when it should be paid right here. We have some of the finest melons raised right over here in York county, and there is no reason why melon growing cannot be developed into one of the most successful and profitable branches of horticulture in our state.

PEACHES.

By W. W. FARNSWORTH, *Waterville, Ohio.*

I am glad to be with you this morning, and bring to you the greetings of the fruit growers of the Buckeye State.

It seems that anything outside of the apple does not receive much attention. I am not jealous of the prominence of the apple; the consumer has been paying a liberal price for the fruit, and it has become so profitable that there may be some excuse for giving it the prominence it has attained. Still, there are other varieties of fruit, both of the large and small varieties that can be made equally as profitable. Take for instance the first of the spring fruits, the strawberry, or, of the larger fruits, the peach, of which I am to talk to you this morning.



The first thing, perhaps in the growing of peaches, is the soil, and I fear that in this, very often, has been laid the basis for mistakes. We have been told that the peach will do best in a soil that is poor. I believe this is a mistake, and in the light of our present methods and knowledge, it does better to have a rich soil, although

we must be careful not to have too much nitrogen, so as to permit the trees to grow too rapidly, but I believe a good, rather heavy soil is the best. We have there in Ohio the Catawba Island section, which is a low, flat rather heavy soil, naturally underdrained by a layer of sand, which also acts as a conservor of the moisture; and there is also the section along Lake Erie, where the climate is moderate, and where they do not seem to feel the lack of air drainage so much as in some of the inland sections. We realize, however, that the peach will not thrive with wet feet.

In selecting a soil, I would give preference to a soil that is moderately rich, and well-drained; if it is not well drained, it should be made so. In your rolling country, you have an opportunity to select soil that is naturally drained. With us, in Ohio, we have to select our soils, and in many cases underdrain them by tiles very thoroughly. In selecting a soil for growing peaches, I would like to get a soil in condition to grow a first-class crop of potatoes, and one of the best ways to get it into this condition is to grow a first-class crop of clover and plow it down. We prefer to plow it down in the fall, and plant in the spring.

Some have been using the smaller sized tree. Having had trouble in securing suitable trees, I undertook to propagate some on my own place. They grew larger than any trees I had ever planted, and I was tempted to throw them on the brush pile, but I wanted to plant the trees, and could not get them the size I wanted, so I planted them, and gave some to my neighbors, and they gave me better results than any other trees I have ever planted, and I believe we have been making a mistake in planting the smaller, weaker trees. I don't want an over-grown tree, but one that has enough vigor and constitution in it to make a good, vigorous growth.

Of course, in pruning you should prune it back to the single stem, at a height you want the tree.

There has been a great deal said about laying out the orchard. We have a very simple way. We simply take the double team and cultivator, and in that way we can lay out the orchard very quickly, and although there may be a variation of one or two inches in a few years it will not be noticed.

The Secretary.—May I ask whether you are on level or rolling ground?

Mr. Farnsworth.—I have fairly level ground. You cannot lay down any hard and fast rule. That makes our profession better than any other. The carpenter knows that if he makes a rule, the joint will come at a certain place, no matter which wood he uses, but in our work we know that this is not so. I am speaking of my own experience, and my soil is fairly level. On rolling soil this plan might not work so well.

After we have the soil in proper condition, and the orchard laid off, we are ready for planting. See that the trees are received in good condition. We use a low down wagon for our planting—one with crossed reach so that you can turn very easily. If the front wheels clear the tree, the back ones will do it also. We load

the trees on this flat wagon, and never leave them exposed to the air any length of time; then we drive on and set the trees in place. The planting is done easily and quickly in this way. One of the points on which many fail, is in leaving too much top on the tree. My idea is that if you can get four or five roots six or eight inches long, it is better than to have a lot of little fine roots. They simply get in the way. Then commence cultivation at once.

The first year raise small crops. In doing this, I would very much prefer to plant vegetables that can be cultivated early in the season. By handling the ground properly, I can get just as much growth as possible early in the season; then by stopping cultivation a short time before sowing other crops that will act as a cover crop, it will save the moisture in the ground, needed for growth later in the season. The strawberry is objectionable, because there can be no cultivation early in the season. However, we overcame that by throwing a mulch around the tree until the fruit is harvested, and then the berries are plowed.

Now, about pruning; this is a very unsatisfactory subject to talk about unless the speaker has a tree and a pruning knife. We may say, however, that the peach requires much more pruning than any other fruit. It is about midway between the apple and the grape in that respect. We cut out all the useless branches the first year, and cut the tree back to about 18" or 20". Then we afterward go over it each year carefully, although we do not cut so much as the first year. We think we get a better growth in this way. Then in the spring we go over it carefully and prune so that there will be no two branches directly opposite. If we think we have been a little too easy in the beginning, we cut more sharply. The peach, you know puts out new branches every year, and bears only on the new wood.

My soil, on which I am growing peaches, is a sandy loam, a good deal darker now than when I first got it, because of the humus I put in it. It is a very friable, mellow soil, but I find that I cannot cut back as severely as they can on heavier soil. In my case, I have been obliged to give the trees a little more room than is usually allowed. I would rather have a few less trees and give them the room to spread out, so as to get the sunshine and air and get the proper color, than to have double the number of an inferior quality and flavor. My last orchard was planted 22 x 25, of Elberta and Kalamazoo. This may be a little more than necessary, but I think the tendency is to give a little more room. It was my privilege to spend three or four weeks with the fruit growers of Michigan. The people up there grew peaches on sandy soil, and got splendid results. They gave clean cultivation, but they failed to give the cover crop, and the result was that in a few years the soil was robbed of its humus, and the peaches began to fail with the Yellows and the Little Peach, and in a very short time, the peach industry of Michigan sank to a very low ebb, and to-day there are many less peach trees grown in Michigan than were fifteen or twenty years ago. They are beginning to realize the necessity of keeping humus in the orchard if they want to make a success of raising peaches.

It is with the fruit just as it is with the animal; in cold, hard weather, the weak, sickly animal will succumb; and so it is with trees. Our method is to start cultivation early in the season, and cultivate largely the early part of the season. Our time of starting cultivation will depend largely upon the weather, and the character of fruit the tree is bearing. If it is a light, and a rainy season, we often stop the first of July but if it is dry, and the crop is a heavy one, we often cultivate on right up to the first of September.

Now, then, as to the cover crop; in our orchard work we often use oats or barley, preferring barley. We have to use something that will make as great a growth as possible before the winter sets in, and plow it as early in the spring as possible, so that it will not take up any of the moisture that the tree needs. In the case of a young orchard, where we can sow early, we use clover or vetch. We have been growing vetch for fifteen years. It has a tendency to creep on the ground so thoroughly that it keeps out the frost, and if you can keep it growing in the Spring, it will be of great service.

It has been said that manure is a poison to the peach, but I think that after the orchard is established and has borne one or two full crops, we can very profitably use more stable manure on it than most of us have been doing. This also depends somewhat on the variety. The Elberta will stand more manure than any other variety. As one of our growers puts it, "the Elberta is a hog for manure." In the spring of 1909 I gave quite a liberal supply of manure to an orchard that had borne two or three crops, putting on about fifteen tons to the acre. We had sprayed that orchard the year before for the scab, and it denuded the trees, and to remedy it, I gave them this application. The result was that the growth for 1909 was very satisfactory, and last year we picked over 600 bushels per acre from that orchard, all running very high in quality. So I believe that in connection with the phosphoric acid, we can use larger quantities of the stable manure to supply nitrogen. We use the South Carolina dissolved rock, and apply it at the rate of forty pounds to a ton of stable manure and spread it at the same time. I believe that we get better results by balancing it up this way.

The matter of spraying has been developed largely in the last few years. A few years ago we sprayed only for the Scale, but we find that by using the lime and sulphur, it takes care of the leaf curl. For a long time the rot and spot and scab were very prevalent; then we began to use Bordeaux, using it very weak; we began by using about a pound and a half of the copper sulphate to three or four pounds of lime and fifty gallons of water. But we found it hurt the foliage, and then we learned of the self-boiled lime-sulphur, and we find by its use that we can control all these pests. For the curculo, we spray two or three times with arsenate of lead. The Yellow St. John seem more susceptible to this pest than any other variety.

I want next, to speak for just a moment about thinning. Until recently, growers seemed to think that thinning was all right in theory, but not in practice. I went up to the meeting of the Roches-

ter fruit growers a few years ago, and found some of them rather inclined to sneer at it, but it is something you cannot afford to overlook. It is a good deal more profitable to sell peaches at \$2.50 a bushel than at \$1.50, and while the consumer may be inclined to grumble a little at first, a week or two later he will remember only the quality. Give them the best and give them a square deal, and they will come back again. I believe that a good many of us are a little inclined to be short-sighted in that respect. We seem to think that if we only get the consumer's dollar it ends there. But it does not end there; we want that consumer to come back to us again, and the surest way we can get him to do this is to give him good value for his money and not overcharge him.

We begin to thin immediately after the June drop because those peaches remaining on the trees take up the moisture and fertility required by the peaches we are going to market. Now, in thinning



THYME ON THE FARM OF FRANK SHALLCROSS, FRANKFORD, PHILA., PA.

See Address of Prof. R. L. Watts.

there is no hard and fast rule to follow any more than there is in any other line of our work. Some say 6" to 8"; but the best way is to go into your orchard and look it over, and then get the right distance. Most of us err on the side of not thinning enough, rather than too much. I thin all kinds of fruit in my orchards—apples, peaches and plums, and get my best results in that way. We began to thin our plums last spring, but in the midst of our thinning, cherry picking time came on, and we were obliged to drop everything for at least five weeks and get our cherries off; and at the end of that time, we found that on the trees that had been thinned, the plums were 50% to 75% larger, and we got more bushels.

Now, just a few words regarding picking and marketing. I think a great many growers do not do enough work on their fruits

to get the best returns. Some growers pick them all at one time. We go over our peaches every other day, and then make several grades of them. It means extra work to do this, but you get better quality, better work, and the consumer is better satisfied. We are better situated for marketing our crop than a great many growers. We are within half a mile of an electric road that gives us unequalled service. They place a car on the siding for us every night, and we keep our fruit in cold storage until evening, and then put it on the car. Early in the season we use the eight-pound basket, like the grape basket, because at that season most of the fruit is used for eating. Later in the season we use the half bushel and bushel basket. For long shipments we use what is called "the seven-eighths basket," which will hold a full bushel heaped up. We grade our peaches carefully by hand, and then cover the basket and set it in the car carefully, so there will be no bruises. Then in the evening this car is taken out behind the regular car and shipped South. We have found that it is a mistake to depend entirely upon the larger towns. In towns of five to six thousand they have not the facilities to get fruit that the larger cities have, and they are glad to pay the price. Also, early in the season, we go to see the grocers, and arrange with them to handle our fruit; we work for their interest and expect them to work for ours, and it is usually very satisfactory to both sides. One of the firm goes with the car and sees that the fruit goes where it is intended to go, and gets there in good condition. Of course, this is unusually good service, but I think you can easily prevail on your trolley company to give you the same kind of service, especially if there are competing lines near you, or the trolley has a railroad to compete with. You will be astonished to see the number of peaches you can market right near home.

Possibly this is all the time I should take, because I believe in allowing plenty of time for discussion.

A Member.—What do you think is the best distance for peaches?

Mr. Farnsworth.—That will depend on soil and variety. I am planting smaller sizes 20 feet apart and larger ones 26 feet.

Mr. Thomas.—How do you treat the borers?

Mr. Farnsworth.—We go over them about twice a year; you can mound up in the fall, when there is not much to do, and it will be of some help, but I think our preventative spraying is the best method. We have very few borers.

A Member.—Do the roots of the trees ever give you any trouble in the tile?

Mr. Farnsworth.—No, sir; if I were draining a stream or a pond they might.

A Member.—Have you ever tried painting trees with white lead and linseed oil?

Mr. Farnsworth.—No, sir.

A Member.—What varieties of peaches do you use?

Mr. Farnsworth.—The last orchard I planted, I used the Carmen, the Champion, Yellow St. John, New Prolific, Kalamazoo, Elberta and Golden Drop.

A Member.—How much later does the Kalamazoo ripen than the Elberta?

Mr. Farnsworth.—Well, it is a little bit later, but it begins to ripen before the Elberta is gone.

A Member.—Almost the same size as the Elberta?

Mr. Farnsworth.—No; it is a smaller peach. We have found the Elberta a profitable market peach; some growers do not grow anything else, but we have found it advisable to grow something a little different that we can sell a little cheaper for canning. I am planting more Gold Drop and less Kalamazoo.

A Member.—Have you used commercial lime-sulphur on peaches, and if so, with what effect?

Mr. Farnsworth.—I have not; I know of a number who have, and I am going to try it this year; it is still in the experimental stage.

A Member.—How many sprayings do you give for rot?

Mr. Farnsworth.—Twice a year, of course, with some of the later varieties it might be well to spray three times.

Mr. A. R. Tyson.—Does the self-boiled leave a sediment on the tree?

Mr. Farnsworth.—Yes; it is apt to do so.

Mr. A. R. Tyson.—Has the time of cultivation in the spring any effect on the buds coming out?

Mr. Farnsworth.—Well, I know some growers do not want to cultivate until the blossoms begin to fall, and you are losing moisture, but I like to go over my orchards just as soon as I possibly can in the spring.

A Member.—Have you any rot?

Mr. Farnsworth.—I had until we began to spray.

A Member.—When do you spray for it?

Mr. Farnsworth.—About two or three weeks after peaches have formed; and about ten days afterwards.

A Member.—Do you use arsenate of lead with the spray?

Mr. Farnsworth.—Not when we are spraying with self-boiled lime-sulphur.

A Member.—Is the Gold Drop subject to rot?

Mr. Farnsworth.—Not so much, we find, since we have been spraying; the Champion is.

A Member.—Do you have much trouble with the Yellows?

Mr. Farnsworth.—No; we have never had any trouble in our county.

Prof. Surface.—What time do you spray for the rot?

Mr. Farnsworth.—About two or three weeks after the blossoms drop. I believe, however, that our dormant spraying with lime-sulphur has a great deal to do with our getting rid of the spores that hold over.

A Member.—What do you do for curculio in the peach and plum?

Mr. Farnsworth.—In the summer we spray with lime-sulphur, about 1-40, and about 2 pounds of arsenate of lead to 50 gallons of water. For curculio we prefer to spray from one side one day, and then wait a day or two and then spray from the other side. The next time we spray simply with the arsenate, and the third time, which is usually the last time, we again use the lime-sulphur and the arsenate of lead. We not only want to kill the Scale, but we are controlling the fungus diseases at the same time, and incidentally we are cleaning out our currants, which grow in the same orchard.

A Member.—What has been your experience in spreading out young trees, leaving three or four main branches, and then not cutting away much wood, but practising summer pinching?

Mr. Farnsworth.—I have done that the second and third years.

A Member.—In buying the Gold Drop, are you sure you get the variety?

Mr. Farnsworth.—There is nothing sure except death and taxes. A pretty good way is to write to the nurseryman first, and

ask him what he has, before you tell him what you want. It is just like a man coming to you for advice; find out what he is after, and give him what he wants, and he is your friend, and has a very high opinion of your ability.

A Member.—Do you use the European varieties of plums?

Mr. Farnsworth.—Entirely so; we tried the other, but did not find it profitable.

A Member.—What variety of plums do you grow?

Mr. Farnsworth.—Many of them—the Bradshaw, the Niagara, the Lombard, the Reine Claude, the Monarch and Grand Duke.

Prof. Surface.—Does it pay to grow plums as well as peaches in the same soil?

Mr. Farnsworth.—Well, it has not done so heretofore, but it is beginning to do better the last year or two. I believe it is advisable to spread your crop over the year, rather than to have only one variety.

Prof. Surface.—Do you use peach for filler in your apple orchard?

Mr. Farnsworth.—No; I use apples—the Jonathan or the Wealthy or something of that kind.

Prof. Surface.—Do you grow currants under your peach trees?

Mr. Farnsworth.—No; I grow them with the apples and plums.

A Member.—What strength do you use the lime-sulphur?

Mr. Farnsworth.—1-33 on the apple, and 1-40 on the pear, peach and plum.

Prof. Surface.—With what results?

Mr. Farnsworth.—The very best.

The President.—Before adjournment I want to announce the following committees:

Committee on Resolutions.—Mr. F. H. Fassett, Mr. J. W. Prickett, Mr. Abram Hostetler, Mr. U. W. Harshman, Mr. S. L. Brinton.

Auditing Committee.—Mr. John F. Boyer, Mr. A. O. Finn, Mr. T. C. Foster.

WEDNESDAY, JANUARY 25, 1.30 P. M.

President Hiester in the Chair.

TOMATOES.

BY C. W. WARD, *New Carlisle, Ohio.*

We will first consider the growing of tomatoes for the canning factory and late tomatoes for city markets. There are limitations to the profitable production of tomatoes at canning factory prices. One of the most successful growers in our locality discontinued growing for the factory recently because he found that the distance he was obliged to haul, about four miles, reduced the profits to too low a figure. The distance which a grower can afford to haul tomatoes to the factory will depend very largely upon the character of the road over which he must haul. Tomatoes can be grown profitable at factory prices only when the soil is in a condition capable of producing at least 200 bushels or six tons per acre. Even at this figure the profits are small. If 350 or 400 bushels can be grown the profits are very satisfactory. Another drawback to the growing of tomatoes for the factory in some places is the difficulty of securing sufficient labor at picking time.

These limitations will apply equally well to the growing of late tomatoes for the city markets. The labor problem is even greater than when growing for the factory owing to the extra labor required in the cleaning, grading and packing of the fruit. With a given amount of help a considerable larger area can be grown for the factory than for the city market.

We have been growing tomatoes for the factory at \$8.00 per ton or about 24 cents per bushel. Our place is two and one-half miles from the factory and twelve miles from a city market. I consider this price comparable with 50 cents per bushel in the city. This difference would be somewhat reduced if we were nearer the city market. It is quite a satisfaction to know that all of the crop is sold even if the price is low as is the case when contracting to a factory.

The Soil.

Late tomatoes can be grown successfully on a wide range of soils. A sandy loam is perhaps to be preferred to any other type although a clay loam is very satisfactory. In any case the soil should be well supplied with available plant food and organic matter. A poorly drained soil is to be avoided as is one that dries out too easily. An application of stable manure supplemented with phosphoric acid and potash and in some cases nitrogen will increase the yield on nearly all soils. The amount of manure or commercial fertilizer which it will be profitable to apply will depend on the previous treatment of the soil. When the soil is rich and full of

humus the application should be comparatively light as too much available plant food in the soil will grow vines at the expense of fruit. With us the Stone is grown more than any other variety. If it could be bred or selected so that it would begin bearing two weeks earlier it would be an ideal tomato for the factory or city market.

There is no greater mistake made in connection with tomato growing than the setting of small spindling plants. This mistake is more commonly made by those who grow for the factory because of the poor facilities which they frequently have for the growing of the plants. When the factory people raise the plants themselves they often grow them too thickly and thus send them out in bad condition.

Another serious mistake is the carelessness about the source of the seed supply. When the company furnish the seeds they often purchase them at the lowest price possible. The idea seems to be common that any quality of seeds that will grow is good enough. At most the seeds for an acre cost very little and the best obtainable are none too good. Another cause of serious loss in our locality is the lateness of the setting of the plants. The season with us is not long enough to mature all of the fruit on late kinds and a delay of two or three weeks in planting means a big loss in the fall.

We sow the seeds for our late tomatoes about March 15th. As soon as the plants are large enough to handle they are pricked out into flats about two inches apart. When they begin to crowd they are transplanted either into two-inch pots or into flats again but given more room. If potted the pots are plunged into soil between the tomatoes in the greenhouse. Plants grown in this way are stalky and can be planted with a tobacco planter or by hand. We set four acres to this kind of plant in one day last season with the aid of a tobacco planter. No water was used as the soil was in a moist condition. The ground had been marked one way and the boys dropped the plants in the marks. They did a much better job than I expected and while it was some more trouble than it would have been to have rowed them only one way it was a decided advantage to be able to cultivate them both ways. Nearly every plant grew thus we secured an excellent stand.

When the plants are small the cultivating is done with a two-horse cultivator. After the vines begin to spread we cultivate with a one-horse cultivator once in a row. We cultivate to conserve moisture as well as to destroy weeds. If the cultivating is done at the right time and frequently enough no hoeing and little weed pulling will be required. If the soil becomes cloddy on the surface it is a good plan to run through the spaces with a plank drag. Women make good pickers and boys and girls can be used also if an older person is with them. We pick in baskets and empty into crates. A flat hay rack or ladders as they are sometimes called, mounted on a low wagon makes a good conveyance for hauling. Springs should be placed under at least one end of the rack. In hauling tomatoes long distances they carry much better in small baskets than in bushel baskets or crates.



TWO TYPES OF SWISS CHARD GROWN BY WALTER YAHN, ONLEY,
PHILA., PA.

See Address of Prof. R. L. Watts.

Early Tomatoes.

The profitable production of Early tomatoes has greater limitations than the profitable growing of late tomatoes. Early tomatoes can be grown successfully only on certain soils. Besides the requirements which were mentioned for late tomatoes the soil should be what is popularly called an early soil. A sandy loam with a southern exposure is generally considered best for early tomatoes. Clay soils are not well adapted to this purpose. It is also important that the location be near a good market or shipping point. Unless the person who grows early tomatoes has a greenhouse or hotbed in which to start the plants or can buy them already grown in one of these places his chances of success are slim.

It is of even greater importance that good seed be secured for early tomatoes than for late. We should not only have a good variety but the best strain of the variety we select obtainable. In my judgment there is much yet to be done in the way of improving the tomato. We may not need new varieties but we do need better strains of the best varieties now grown. Have you ever kept a careful record of the yield of a number of plants of a variety grown under similar conditions? If not try it and see for yourself what a variation not only in total yield but in time of ripening these plants show. Some plants will ripen all or a large part of the fruit at one time and early in the season while others will ripen the bulk of their fruit late in the season or a little at each picking throughout the season. Some plants will produce two or three times as much as other plants adjacent to them. Is this all due to variation in environment? Much of it may be due to soil variation but I am confident that some of it is due to what we call inherent tendencies

or the power of the plant to reproduce itself without respect to its surroundings. When we save seed from a fine tomato which has been selected from a basket of fruit we may be getting just the kind of seed we do not want. We often find the finest specimens of fruit on vines which have very few fruits on and are therefore not productive. When we select specimens to save for seed from a basket we know nothing of the character of the plant from which they come. It is very important therefore that we take into consideration the entire plant when making selections for seed or our work will be useless. If we expect to do thorough work in the way of improving the tomato by selection we should save seeds from a few specimens of several apparently productive and otherwise satisfactory plants and test them out for several seasons much after the plan followed by the corn breeders in their ear-to-row work. The fact that tomatoes can be propagated from cuttings and thereby kept pure should be of great help in this work.

Where a strictly early variety is wanted it is doubtful if there is anything superior to the best strains of Earlian. For medium early the Beauty is a first-class purple sort and Chalk's Early Jewel a good red tomato.

We grow the plants of the early varieties in much the same way as we do the late sorts except that the seed is sown two or three weeks earlier. In transplanting the second time the plants are set in four instead of two-inch pots. This enables them to grow to a larger size without becoming pot-bound. The plants are removed from the pots at the greenhouse when we are ready to plant them and hauled to the field in flats made from glass boxes.

The last two or three seasons we have had long spells of cold wet weather after some of our early plants were set in the field. The plants set after the cold spell have always done better than those set before. From this experience I have come to the conclusion that it is not always advisable to be in too much of a hurry to get the plants in the field.

With us there is not as much staking of tomatoes as was practiced a few years ago. The scarcity of help recently has no doubt had some influence along this line. Where it is not necessary to economize space mulching with straw will answer much the same purpose as staking. The mulch will keep the fruit clean and at the same time conserve the moisture. One of the drawbacks to the use of mulch is that it affords a hiding place for crickets and other insects which perforate the skin of the tomatoes and render them unsaleable.

Greenhouse Tomatoes.

Tomatoes may be grown in the greenhouse the year round if desired. A few of the Ohio vegetable growers devote a part of their houses to tomatoes each fall. They aim to have them ripening at least by Thanksgiving time and in some cases considerable earlier. It is important to have the plants and fruit as well quite fully developed before the usual dark, cloudy weather of winter sets in. Tomatoes require sunshine for their best development but when the



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With us there is not as much staking of tomatoes as was practiced a few years ago. The scarcity of help recently has no doubt had some influence along this line. Where it is not necessary to economize space mulching with straw will answer much the same purpose as staking. The mulch will keep the fruit clean and at the same time conserve the moisture. One of the drawbacks to the use of mulch is that it affords a hiding place for crickets and other insects which perforate the skin of the tomatoes and render them unsaleable.

Greenhouse Tomatoes.

Tomatoes may be grown in the greenhouse the year round if desired. A few of the Ohio vegetable growers devote a part of their houses to tomatoes each fall. They aim to have them ripening at least by Thanksgiving time and in some cases considerable earlier. It is important to have the plants and fruit as well quite fully developed before the usual dark, cloudy weather of winter sets in. Tomatoes require sunshine for their best development but when the

fruits have attained their normal size they will ripen even in cloudy weather. The plants of the fall and early winter crops are allowed to produce fruit as long as they give profitable returns. Such seasons as the present when we have so few clear days the fruits ripen very slowly but on the other hand prices have been good, partly as a result of the slow ripening.

A much larger area is devoted to tomatoes in the spring and early summer than in the fall. We do not grow any in the fall but make a specialty of spring tomatoes. Tomatoes are a very satisfactory crop to grow under glass when weather conditions are favorable as is usually the case in the spring. There is a beauty and quality about greenhouse grown tomatoes which makes them superior to those grown in the field even when the field grown fruits are allowed to mature before being picked and there is a very wide range of quality between the greenhouse tomatoes and those which are picked green as is usually the case, of necessity, with southern grown tomatoes. Those who know the difference in the quality of greenhouse grown and southern grown tomatoes are always willing to pay much more for the former. We have been able to get \$2.00 per bushel for greenhouse grown tomatoes when early homegrown field tomatoes would not bring over \$1.50.

Varieties.

There is quite a difference of opinion among growers as to which varieties are best adapted to forcing. It should be understood whenever this subject is under discussion that the varieties which are suitable for spring and early summer forcing may not be satisfactory in the fall and vice versa. The small fruiting varieties are the best for fall forcing as the markets at that season demand small fruits. In the spring larger fruiting varieties can be grown as the prices are not as a rule as high as in winter and thus the trade is not as particular as to size. The small fruiting sorts produce such very small fruits toward the close of the season that they do not sell well when they are forced to compete with the larger fruits from the south and the local field-grown crops. The fruiting season in the greenhouse with us extends from June first to August fifteenth, thus we must sell in competition with southern-grown tomatoes from the start and with local field-grown tomatoes toward the close of the season. Our list of varieties this year consists of Magnus, Beauty, Globe, Stone and Grand Rapids Forcing.

Starting the Plants.

We have found it necessary, owing to the very dull winter weather which we have experienced the last two or three years to sow the seeds soon after the first of November. If half or more of the days were fair it would not be necessary to start the plants until about December 1st. We aim to have the plants ready to set in the permanent beds about March 1st. This brings them into fruiting about Decoration day. In some localities it would no doubt

be better to get the plants in their permanent places earlier but with us February is usually a pretty cold month and we prefer to keep the plants in the plant house until the worst of the cold weather is over. Then too we plan to have the second crop of lettuce coming off the last of February and first of March and the tomatoes are set with the third crop of lettuce.

The plants are transplanted three times the same as for Early field-grown tomatoes. When a crop of lettuce is grown with the tomatoes it is best to have the lettuce started before the tomatoes are set in the beds, but this cannot always be done. The lettuce should not be allowed to crowd the tomatoes too much as it will make the plants spindling. Lettuce grown in this way will be light in weight but the returns usually justify the effort necessary to produce a third crop.

The tomato plants are set about eighteen by twenty-one inches apart. A home-made wire, twisted into corkscrew form at one end and looped at the other is screwed into the ground by the side of each plant. Wires are stretched the full length of the greenhouse directly over each row of plants and above the truss rods which support the roof. A string is fastened to the loop below and tied to the wire above. In training the plant up they are twisted about the string or tied to it with raffia or both. All suckers or side branches are broken off when small. Only one stem is allowed to grow to each plant. Our beds are six feet in width thus four rows of tomatoes are set in each bed. This makes it very convenient for work with the plants when pruning, pollinating or picking. It is not advisable to set closer than this distance and some growers prefer two by two or even two by three feet.

Pollinating.

As soon as the blossoms commence to open hand pollinating begins. We use two sticks about 18 inches in length for this purpose. One stick has a spoon shaped end whittled into it and the other a spatula at the end. To pollinate the ladle is held under the flower and the blossom tapped gently with the spatula. This jars the pollen into the ladle and when a sufficient quantity of pollen is secured to show in the ladle the flowers are pushed into it until the end of the pistils touches the pollen. The releasing of the pollen and the placing of it on the pistil is done in one operation after a start has been made. We aim to go over the plants every other day and all of the blossoms which are fully open are treated at each operation.

There is a good deal of difference in varieties as to the need of hand pollination. Some varieties will set much fruit without any hand pollinating while others will set almost none. When the blooming period comes at a time that will permit of wide open ventilators much of the time hand pollinating is not so important as when the houses must be kept closed or nearly so a good deal. We think it safer to do a little more work than necessary than to run the risk of heavy loss through a small saving in labor. Care

should be taken to do the work with as little injury to the pistil as possible as rough fruits often result as a neglect of pollinating or from careless pollinating.

Picking and Packing.

The picking is done three times a week. Only the specimens which are nearly or fully colored are picked. The grading is done on a bench made for that purpose. Two grades are made and all fruits which are included in the first grade must be smooth and not below a certain size. The second grade is made up of fruits too small for seconds but not too small to be marketable and those that are a little rough but not rough enough to make them unsightly. It should be said in this connection that greenhouse-grown tomatoes are much more liable to be rough than the same varieties grown in the field.

We pack in small baskets similar to those used by many southern growers weighing out five pounds in each basket. These baskets are packed in crates made to hold four baskets or twenty pounds. This is a neat package but is adapted only to warm weather shipping.

We seldom get more than \$2.50 per crate nor less than 75 cents and that only at the last of the season. Two pounds per square foot of bench space is considered a good yield. The supply of southern tomatoes on our markets governs the price which we are able to get for the greenhouse stock to a considerable extent but when the trade has once learned to know the difference in the quality of the greenhouse grown and southern grown tomatoes, there is little difficulty in disposing of it at quite an advance over the southern stock. The markets could handle to advantage many times the present output of greenhouse tomatoes.

The President.—Don't you grow head lettuce at all in Ohio?

Mr. Waid.—No; the reason is because we don't succeed, and our people seem to prefer the other kind.

STRAWBERRIES.

BY J. W. KERR, *Denton, Maryland.*

No other fruit plays so diversified and inconsistent a roll as this. Under, even ordinary management, it is remunerative to the grower and most acceptably increases his revenues wholly independent of the tariff. It presents itself at a season of the year when its refreshing acidity is an unfathomable joy. In communities where grown on a large scale, it becomes the innocent disorganizer of the household and a harassing family nightmare. Two cents per quart for picking presents a temptation that mobilizes and leads to the barracks hastily improvised for them all the house help, for miles around, without limitations as to color, nationality or religion; nor

does it stop at robbing the housewife of her help, but all too frequently, able bodied men hired by the year to work on the farm, suddenly fail to answer the roll call of their employers, and hie themselves with their wives and children to the berry fields. It is quite natural, when house-hold customs and out-door interests on the farm both are so severely jolted, that the cause should be severely criticised and denounced; but that little blushing sinner of a strawberry just keeps on covering itself with blushes, so as to better its chances to imitate the smart country girls and boys that are swallowed up in the large cities.

"Between the bays" the strawberry (to put it accurately) is exploited rather lavishly. From one, to one hundred acres of strawberry plantation, under the management of one man; and inconsistent as it may appear on its face, the larger the acreage, the more thorough and business like, from start to finish, is every detail and essential, which as a rule, at the final wind up of the season, writes the broad strawberry smile on the Christian countenance of the man behind the check book.

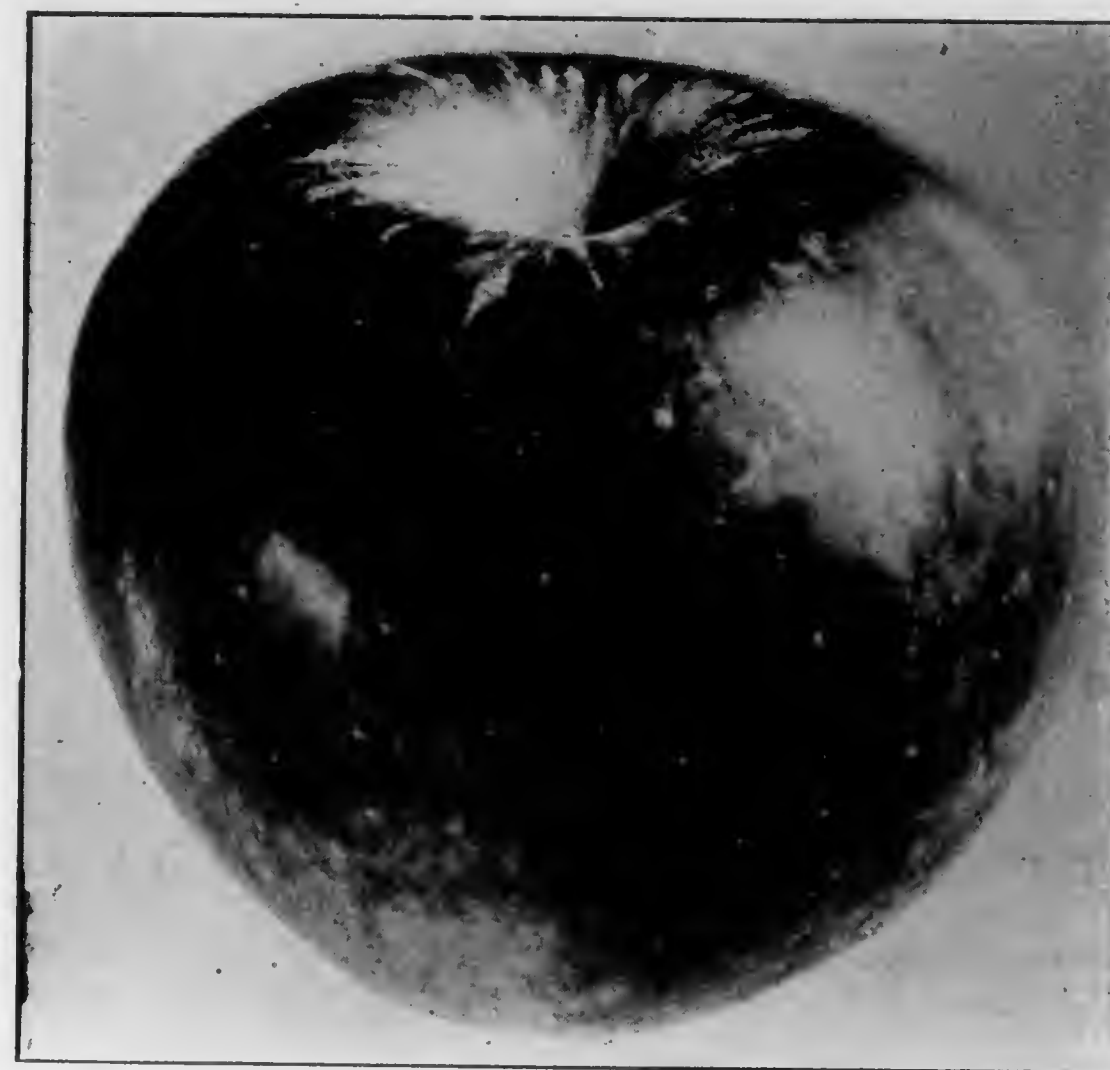
The large growers by force of circumstances, affecting soils more particularly, but market peculiarities to some extent also, may differ in the minor lines of procedure, but in the great essentials of the work their operations are in exact accord. In explanation one grower may possess a liberal acreage, that nature has fitted in important particulars, for the successful growing of some varieties,—fastidious in soil requirements; and such kinds,—to the exclusion of varieties more generally adaptive to different soils, are most successfully and profitably utilized. Again, the grower may not have on his farm, the kind of soil upon which such varieties can be depended upon, for a good and profitable yield. Ask this grower to explain the absence in his plantation of such kinds and he will truthfully tell you that they don't pay him. In the county where I live there is one of the largest growers on the peninsula—a man noted for his enterprise, and clear-cut business thoroughness; this man grows and picks from twenty to thirty acres annually of the Gandy, a late variety that will never disclose its full capabilities unless on a moist rich soil. The gentleman I have in mind bought such land adjoining him at a nominal figure, because it was wet and swampy



and overgrown with bushes. Cleared up, and a good system of underdrains installed, made it ideal land for growing the Gandy strawberry to perfection. There are other late ripening kinds that doubtless are more satisfactory on land affording less moisture, but on somewhat low, dark, loamy soil, with clay subsoil, the Gandy holds the Blue Ribbon.

None of the large growers so far as I am aware use the planting machine for setting their plants. While for certain kinds of vegetable plants this machine is used to some extent, strawberry growers prefer the disk marker to open the rows; setting the plants by hand to the bar side of furrows thus prepared. The plan of cross marking the land and setting the plants at the angles of the squares, sufficiently distant from each other to permit the passage between them of a narrow cultivator, and cross cultivating, while it lessens the expense of hand hoeing considerably, is making no great gains in popular favor. What is everywhere known as the matted row plan is given the preference. With the strawberry, as with all other fruits; results are dependent upon the efforts bestowed in their production. In the matter of cups and crates, wonderful progress has been made. Did the strawberry growers of to-day have to pay as much for cups and crates as was the case fifty years back, their business would promptly collapse. Think of it—\$30 per 1,000 for quart cups; \$2.00 each for thirty-two quart crate. The gift quart cups at that period could be had at ten dollars per thousand in the flat, the growers putting them together themselves. Under present conditions the forty-eight quart crate is most popular and is furnished, including the forty-eight cups and divisions for less than forty cents each. The old go-as-you-please plan of shipping, every man for himself, single handed, bush-whacker like, had a much longer lease of existence than it deserved. Metaphorically the tail had to wag the dog before escape from the old growers was practicable. Almost at the extremity of the peninsula a few years ago, a fruit and vegetable exchange was organized and conducted on sound business principles. Results were a genuine revelation. To-day branches of that exchange in nearly all the peninsula counties are substituting system and method for the "Any-way-so-you-get-there" practice that formerly attenuated the bank accounts of the shippers. These exchanges are in constant touch with the market conditions of all the cities and large towns that are in timely reach of perishable products, and the goods have daily consignment to points where prices are most inviting. At some points strawberries, as well as other fruits, are sold at public auction by the exchange, thus introducing a mild form of speculation, that imbues the buyers and the growers with the excitement of expectancy. The loaded wagons are driven to the stand of the Auctioneer, the berries are hurriedly examined by the buyers that locate at these points. If the bids are satisfactory the grower accepts and returns home with the money for his berries in his pocket. If the grower suspects any understanding among the buyers to co-operate in fixing prices, they ship through the exchange instead of selling at the railroad station. The inauguration of these long needed reforms

insures to every member of such exchanges a fair and just value for his fruit. If it is extra fine in quality and condition, the quick perception of the buyer is prompt in acknowledgment. On the other hand, where fruit grades low, the grower receives a very impressive admonition to mend his ways.



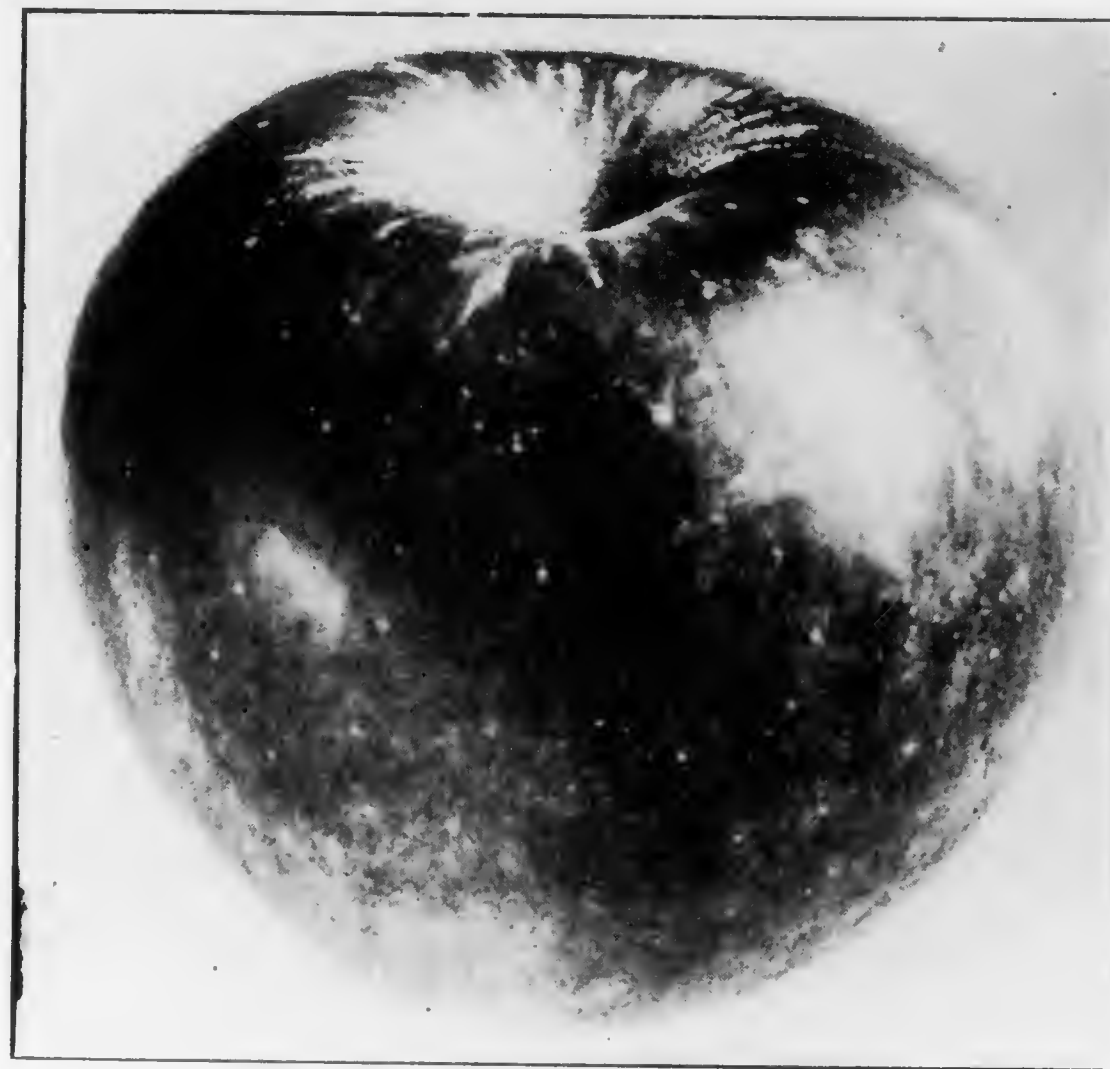
STAYMAN WINESAP FROM MR. KERR.

We sometimes read of marvelous results and achievements by special methods of cultivating or growing this fruit; and while such sensational revelations may be true in a prescribed sense, when the entire story is told, instead of inspiring the confidence that would beget widespread invitation, it is soon lost in the flitting shadows of forgetfulness. In localities where the growing of this fruit is made a business, every principle of economy and progress is worked out in finest detail by men whose financial prosperity demonstrates quite clearly that they not only excel in the business requisite but also that penetrating and comprehensive study of plant nature, that insures to each variety, situation and soil fertilization, such as its individuality craves, and must have to make it profitable. By the unerring scales of practical test, they determine the value of novelties, and the new variety is thus accurately analyzed as to its merits. Where plant growing as a business proposition is not combined with fruit growing, a very small per cent. of the annual new productions are observable. You find that disturbing desire for new kinds far more pronounced and conspicuous among the small growers than those higher up. The advent of the Hovey back in the thirties,

and overgrown with bushes. Cleared up, and a good system of underdrains installed, made it ideal land for growing the Gandy strawberry to perfection. There are other late ripening kinds that doubtless are more satisfactory on land affording less moisture, but on somewhat low, dark, loamy soil, with clay subsoil, the Gandy holds the Blue Ribbon.

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though a pistillate, was a long stride forward in American strawberry development. The introduction of the Peabody in the fifties triumphantly marked a great epoch. This fact was especially noticeable in its relation to the breeding or originating of new varieties. The five dollars per dozen for plants, as received by the propagators, who got in on the ground floor, when the Peabody tide was at its flood, caused many who were horticulturally inclined, to see visions, and to dream golden hued dreams, when they were not sleeping. A steady shower of new varieties began to fall upon the public; tinted by the glittering crystals of beguiling hopes and the fascinating charms of unbridled expectancy, hundreds of these little innocents still in their swaddling attire of gorgeous tinsel, were adjudged and condemned as horticultural "goldbricks." They simply made a faint and brief little twinkle, and were promptly replaced by that same shower which seems as though it might "go on forever."

In Fuller's small *Fruit Culturist*, published in 1867 there are named one hundred and twenty odd varieties of strawberries of American origin. In a revised edition of this work, published fourteen years later (1881), the same author only names 94 American varieties. In neither list is there a variety named that is regarded as profitable or desirable by the successful growers of the present. In 1867, Orange Judd and Company published the first volume of their horticultural annual or year book, and in the Introduction by the editor this sentence occurs: "We differ as much from Europe in our horticultural operations as we do in other matters, and it will be a long time before we attain—if we ever do—that state of refinement that comes of a dense population, cheap labor, and great individual wealth." I take it that the word refinement as it appears in that somewhat remarkable sentence has reference to our horticulture only. Be it so, and what do we behold as we look through the Kaleidoscope of progress during the interval between 1867 and the present? Surely the great wealth of individuals no longer bars us from full participation in the ennobling distillations of that European refinement in horticulture. If growing a car-load of strawberries where but a crate was grown in 1867, and distributing the same, at prices so as to make them available to the pent up residents of all our large cities, if this tends toward refinement, our American horticulture is giving its European cousin the busiest time in its history, to maintain its supremacy. If however, a refinement of our horticulture is in any way dependent upon a pauperized condition of labor, it is infinitely preferable that it continue in its plebeian vulgarity. While the standard of excellence as to quality and size has made little if any advancement in strawberry culture, during the last half-century there certainly has been marked progress in meeting and supplying the essentials for field culture, in varieties embodying size, firmness and productiveness; features that vitally affect the interests of growers for distant markets. This question of varieties at best is so very local and circumscribed in its nature, that it resolves itself into a problem to be correctly solved by personal or individual experience only. The general and fixed peculiarities of the plant render it sensitive to any lack, or uncon-

geniality in soil conditions. One variety proves a rank failure where another is every way satisfactory, while perhaps not a mile distant the conditions as to behavior of the same varieties may be just the opposite of this, so that any discussion as to varieties is likely to develop as many sides to the question as there are growers present. When a grower has varieties that are adapted to his soil and situation he betrays a business weakness when by the glamour and glare too common in the introduction of novelties, he is induced to slight or neglect the known, for the specious uncertainty of the unknown. There is a difference, far reaching in its importance, between the commendable principles and spirit of enterprise and progress, as compared with that universal human thirst for change.

A Member.—I would like to ask what varieties you would recommend for home use?

Mr. Kerr.—Where do you live?

A Member.—In Cambria county—heavy clay soil.

Mr. Kerr.—There are a number of varieties that would succeed there, but there is one variety in particular that I think would do very well; it is safe, not so very large, but it is sweet, and it grows easily—Cameron's Early.

A Member.—What is your method of protecting in winter?

Mr. Kerr.—Mulching with straw.

A Member.—Do you let the runners go or do you cut them off?

Mr. Kerr.—Well, we cultivate as long as we can, and then when we get in with the handhoe, if the runners are long we cut them off; if not, we let them go.

A Member.—What sort of implement do you use to cultivate?

Mr. Kerr.—The ordinary five-toothed harrow is used ordinarily. Sometimes we run over the plants with a weeder; this does not hurt.

A Member.—You speak of covering with straw; what do you do when it blows off?

Mr. Kerr.—We have never had any trouble in that way. We put it on in the fall, and it is tramped down when it is put on. It does not cover the plant entirely, and in the spring it is raked off and left in the row, so that the men can stand on it to pick the berries.

A Member.—As I understand it, on the Peninsula there are about a hundred acres out in strawberries on many of the farms?

Mr. Kerr.—Oh, yes.

A Member.—What I would like to know is, how any man can take care of a hundred acres, give them the care and proper cultivation?

Mr. Kerr.—Well, it depends entirely, just as in anything else, on the man. There is not one man out of twenty-five that is capable of doing that. There is not one strawberry grower in ten that can do it, but there are men who do do it, and some of these young men here who are not afraid of work, are going to do it.

A Member.—Well, where do they get their labor?

Mr. Kerr.—Well they make provision for that before they start out with the hundred acres of strawberries. The young fellows who do these things now-a-days know beforehand just what they are going to do, and where they are going to get their labor.

A Member.—Well, there has got to be a good deal of hand hoeing and weeding.

Mr. Kerr.—Yes, but not nearly so much as you think, because you cultivate until your berries get too large.

A Member.—I would like you to tell us something about your plan of culture—what is your means of fertilizing?

Mr. Kerr.—In the first place, our greatest dependence for fertilizers is on the fertilizer factories of Baltimore city. There are, of course, some exceptions; some prefer to fertilize with stable manure, but there is not nearly enough of this to go round. You know there is a great deal of fertilizer required by these plants, and the commercial fertilizer is being used by these growers very profitably.

A Member.—Another thing I would like to know—whether you consider it safe to plow down the fresh sod, so as to be safe from the attacks of the grub worm.

Mr. Kerr.—I think it is rather risky to plow down the fresh sod on account of the grub worm. Outside of that there could be no objection to it. However, the hoed crop would be profitable for another reason, because it would keep down the weeds; tomatoes, beans, or anything else that necessitates clean culture, so that you can prepare for your strawberries is all right. It may give you a little more work, but it will pay in the end.

A Member.—Have you been balancing up with the chemical fertilizer?

Mr. Kerr.—Yes; you have to keep the balance up very carefully as you go along. There is no question about that. And it

requires some spirited young fellow to keep up with the nitrogen, so that he does not get too much of that, and still gets enough.

A Member.—Do you depend on stable manure for your nitrogen?

Mr. Kerr.—No; we depend upon cover crops.

A Member.—How do you prepare for your second crop?

Mr. Kerr.—Well, some of them set fire to the straw and burn it off, and then give it a top dressing with some fertilizer that has a little ammonia in it.

Mr. Atwater.—I have a moderate sized strawberry bed, and also some hens; how do you overcome that?

Mr. Kerr.—You have my sympathy; and I don't doubt in the least that they are your neighbor's hens, too. In that case I don't care to offer advice, because I don't care to breed trouble between you and your neighbors. With the birds we simply surrender; we are not allowed to shoot them, and we cannot afford to cover our beds entirely, so we make the best of it.

A Member.—What analysis of the commercial fertilizer do you use?

Mr. Kerr.—Why, for strawberries, 6-8-10.

Mr. President.—I would like to call on our friend Hale, of Connecticut, to give us his impressions of our fruit since he was here last.

Mr. J. H. Hale.—Mr. President, and Gentlemen: Your worthy President says come up here because you want to see what I look like. A few days ago I took the train in New York, and was awakened in my berth by an argument going on between the porter and a lady who found she had to take an upper berth. She objected to this, but was finally convinced that there was nothing else to do, all the lower berths being full. "But," she asked the porter, "who have I got to sleep over?" "Oh," the porter assured her, "you needn't be afraid, lady; he's a mighty nice-lookin' old gentleman; got on here in New York." Now, that "mighty nice-looking old gentlemen" was me, so I can understand very well why your President wanted me to get up here so that you can look at me, and considering that you have had to look at him for the past two days, I don't wonder.

Now, answering the question that your President has put, you want me to tell you what I think of you since you have grown up; am I to tell the truth?

The President.—Yes; we don't want any bouquets.

Mr. Hale.—Well, then I'll be candid. Some years ago (I think it was ten years ago) I was invited to come over here and deliver an address, and a friend of mine told me "God pity you, Hale; they're a slow-going bunch of people; you can't put an idea into their heads; they'll go to sleep while you're talking to them." Well, some of them did go to sleep, but not many. Then, three years ago, I came back again, and found considerable more life and interest. Yesterday, in passing by this way in coming from Pittsburg, I decided to stop and see whether there had been any improvement over three years ago, and I was charmed with the crowd that was here yesterday, and particularly pleased to see so many live young people. I saw that there was hope and expectancy in the horticulture of Pennsylvania. And then I went over to that hall and saw the exhibit. The first time I was here there were probably a hundred specimens; the next time there were a few more of a little nicer quality. To-day the exhibit shows what has been done by your Experiment Station and your teachers. It is a wonderful change, and it is a wonderful chance that is coming to us in horticulture.

Up in Spokane they are paying for fruit land three and four hundred dollars an acre, and for a planted orchard from six to eight hundred dollars an acre, and the people are paying it, and going away out there. People in my state, and in your own state of Pennsylvania, pay three to five hundred dollars for raw land, and eight hundred to a thousand dollars for land already planted, while there is land right here at home equally as good, at half the price, just ready to plant into an orchard, right in the heart of civilization, on railway lines that will take you to Europe or to California, or anywhere you want to go to spend some of that money you make in your orchard. You are close to the great labor markets of the world. Why, the modern grower here in the East, is in touch with the ports, where he can get all the labor he wants for \$2.00 a day. Out there they have to pay in apple season from four to five dollars a day. And in addition, our fruit is incomparably better in quality. The Western fellows think their fruit is prettier than ours, but we know that ours is better. I took up one of their recent magazines (I think it was the January number) and it was filled with advertisements of the great and wonderful opportunities the West offers to the orchardist, but I turned over a page, and found sixteen advertisements of spray pumps, etc. Now, we people here in the East have wonderful opportunities. I don't think it is all Pennsylvania, or Connecticut, or New York or West Virginia, but the whole Eastern section of the United States, of which Pennsylvania is about the center, has the soil and climate to grow the finest fruit, and then, in addition, we are within twenty-four hours of thirty millions of people who consume it. The Western man has to pay \$300 per car to get his produce to market, while you can do it for \$30 or \$40.

I enjoyed the talk of Mr. Powell and of the Professor with the slides last night, and of Mr. Farnsworth this morning—all plain talk, and all good, plain common sense. The low-headed tree, that is what we are coming to. I left Pittsburg yesterday, and came on here, not particularly through a horticultural country, but I saw a

good many fine trees. Heretofore we have had trees that took a thirty or forty-foot ladder to reach the top. Now we dehorn them, and we have trees where you can stand on the ground and pick the fruit.

We have been told that we cannot interplant an apple and peach orchard. I have done it. I picked a little over six thousand bushels of apples this year, and the pickers stood on the ground and picked every one of them. Next year I hope it will be ten thousand, and I expect every one of them to be picked from the ground, and the same thing with the peach orchards. Keep them down. You say, "how about cultivation?" Well, the man who is going to make money, is going to do it somehow. Keep your trees down.

Just one word more. In order to produce fruit properly, you must do a great deal of spraying. I keep spraying implements in all my orchards, and spray two, three or four times. I have tried every kind of a spraying implement, and I believe you will never get a thoroughly satisfactory spraying implement until you get air pressure. Compressed air makes it possible to do the greatest amount of work with the least amount of friction, and with the greatest economy. You will all come to it sometime; it may be next year, or in five years, or in ten years, but you will come.

I thank you, Mr. President, for this opportunity to say a few words, and let these people see what I look like.

The President.—We have been on very friendly relations for a number of years with the State of New Jersey; we have with us one or two delegates from their State Society, one of their ex-presidents, Mr. E. S. Black, and their secretary, Mr. Taylor. I want to call on Mr. Black to say a few words to us.

Mr. E. S. Black.—Ladies and Gentlemen (before I say "Mr. President," because I knew him before I knew you): I am glad of one thing, and that is, that Pennsylvania knows a good thing when you get it. I was here as a delegate from New Jersey when you elected Mr. Gabriel Heister your President, and I am glad you know enough to keep him. The next year you sent him down to New Jersey, as a delegate, and he came back so full of information that your society has grown since to an extent that I would never have known it, and, at the same time, Mr. Hiester left an impression on the New Jersey Society that has never been forgotten.

I always tell my people that they expect too much of me; they always put me on the program to speak after Herbert Collingwood, the most popular and eloquent lecturer that comes before our Society, and now I come over here to Pennsylvania, and you ask me to speak after Mr. J. H. Hale. I was glad to hear him say what I said to our secretary, Mr. Taylor, last night: that I was glad to see so many young men, and so many ladies present. I want to tell you, however, that when I was down at Hartford last year to visit the Connecticut Society, I saw Mr. Hale's son, that the son is better looking than his father, only he don't talk so much, and I'll lay my money on him every time. He is following in the footsteps of his father, only he is going to be more successful than his father be-

cause (let me tell you aside) what Mr. Hale did down in Georgia, he got a Jerseyman to do for him.

When I was here the last time, six years ago, you had a little exhibition of fruit that I was ashamed of, and I told you then that you would never get any sort of an exhibition until you offered prizes, and now look at your exhibit! You need take off your hats to no state except New Jersey. I told our Society last year that I was proud of it, and when I was in Connecticut last year, every man, woman and child said "I am from Connecticut," and seemed proud of it. I like to see that spirit, and when I came down the Hudson, and crossed into New Jersey, I felt that my foot was on my native heath, and that my name it was MacGregor. Next year I will have to tell our Society that Pennsylvania is fast approaching New Jersey. You have a thousand plates of apples, of every variety, and these young men who are here are laying up an investment that will, in the future, pay them better than any bank stock, better than government bonds, by making these hills and valleys of Pennsylvania grow fruit. Don't go to the city; stay here and while Pennsylvania may have a little graft, you also can grow fruit.

As Mr. Taylor and I came up from Philadelphia the other day, I saw some fine apple farms that were infinitely more attractive to me than that beautiful building up on the hill. In that you have sunk your money, and here you get your money to pay for it. I will say to these young men here, "don't leave the farm; don't marry a girl who wants to go to the city." You know the girls have great influence over the young men, and the ministers realize this in the revival meetings, and get the young men into the church through the girls, so I will say to these young men, "don't marry any girl unless she is willing to go on the farm and roll up her sleeves sometimes, and do her part in the most beautiful work that man can engage in, the raising of beautiful fruit.

Be proud of your work. Be proud of your possibilities. Be proud of your president, and send a representative to New Jersey next year, and if we don't show you more apples, we will show you at least as many. I, personally, and my friend, Secretary Taylor, will go back to the New Jersey Society, and tell them that we saw here a fine-looking lot of men and women and girls, and almost as good apples as we can grow ourselves.

The President.—I would like Mr. Hostetler to tell us what they are doing in Cambria County. If you are doing well, we want to know it, and if you are not doing much, we want you to get busy.

Mr. Abram Hostetler.—Ladies and Gentlemen: I just expect to tell you what you asked for. About two years ago, Dr. Funk from the Eastern part of the State was on the Institute force, and he talked apple culture to us, and we got the idea of starting a County Horticultural Association, and with the assistance of an aged gentleman in our midst here to-day, and of Dr. Funk, we started the Society. As nearly as I can remember, we started out

with some seventy members, at our first meeting. We had a number of meetings, and last Fall we had a little exhibit that drew a great deal of attention. It was a very small exhibit compared with what we have here, but the people of the city of Johnstown seemed to be surprised that we could raise such fruit in Cambria County, just as the strangers seem to be surprised at the display here. We are keeping right on and doing our part. That is about all I have to say.

The President.—We find that one county after the other is coming in just this way. The first year there are only a few members, the next year some more, and then the next thing they talk about becoming bigger than our State Society, and this is what we want. We want each county organization to feel that they are the biggest and best part of the State Association.

Now, it seemed to me that we have reached a point in Pennsylvania where I began to fear we were getting swelled heads and did not know good fruit when we saw it, so we decided to get an expert Pomologist to judge our fruit, and we invited Colonel Brackett, the Pomologist of the Department of Agriculture at Washington to come here and do it for us.

Now, Colonel Brackett, give us your honest opinion of where you think we fall short in our display, because we want to learn how to succeed.

I now have the honor of introducing Colonel Brackett, the Pomologist of the Department of Agriculture at Washington.

IMPRESSIONS OF PENNSYLVANIA FRUIT.

BY G. B. BRACKETT, *Pomologist, Department of Agriculture, Washington, D. C.*

My impressions of Pennsylvania fruit date back to 1876 when I had charge of the Pomological Exhibit at the Centennial Exposition. My attention was there first called to the wonderful productions of Pennsylvania orchards.

My connection with the Exposition required my attendance from its opening to its close, consequently it gave me an opportunity of examining fruit as it was placed on the tables beginning with the ripening of small fruits and continuing throughout the season until September when the great exhibit of tree fruits was made. It was the finest exhibit of its kind ever held in America up to that time. Twenty States as well as Canada and foreign countries were in competition.

Twenty prizes were awarded to Pennsylvania exclusively on her fruit exhibit. The apple was by far the most important fruit. The most popular varieties of this fruit exhibited at that time were Williams, Red Astrachan, Maiden Blush, Summer Queen, Porter, Fameuse, Gravenstein, Lowell, Jonathan, Baldwin, Yellow Bellflower, Swaar, Rhode Island Greening, Roxbury Russett, Seek-no-Further, Gilliflower and Talman (Sweet).

I find only seven of the above mentioned varieties on your premium list, thus showing the great changes that have taken place in the last 35 years.

Among the many valuable varieties found on your exhibition tables are some that deserve special mention:

York Imperial is perhaps one of the most profitable varieties grown in your State and also southward throughout the Blue Ridge and Appalachian region in Virginia, West Virginia and North Carolina. It also grows to perfection in the Middle West, where it finds a ready market in Chicago and other cities of the Mississippi Valley.



It may be of interest to note here that Pennsylvania has originated on her soil 285 varieties of apples of which York Imperial among the number. As most of you know, the tree was a chance seedling found by Mr. Johnson on his farm in York County; finding it to be of attractive color and a good keeper, he got Mr. Jonathan Jessop, a nurseryman, to propagate it. Mr. Jessop thought well of the variety and named it Johnson's Fine Winter. He sent a basket of the variety to the late A. J. Downing, who pronounced it "the imperial of late keepers," and as it originated in York County. Mr. Downing suggested the name of "York Imperial", an appropriate cognomen for this valuable commercial variety. It is now one of the leading varieties in many sections of

the country where it brings large returns to the grower.

Mr. J. N. Craig of Rose Cliff Orchard at Waynesboro, Virginia, and Commissioner Coiner of the Department of Agriculture, Richmond, Va., report an orchard of York Imperial, ten years old, 4 acres, that yielded the comfortable return of \$2,000 the past season.

The Stayman Winesap is one of the most promising varieties now being planted in commercial orchards. It has been found to succeed over a very wide area of country extending from the Atlantic to the Pacific. It originated in Kansas from where it spread first eastward and then westward. The tree is a vigorous grower, very productive of large fine fruit of good quality and it is justly entitled to the reputation it has gained.

Jonathan and Grimes Golden stand at the head of the list of choice varieties, especially for quality, for which they always command the highest market price.

There are several other varieties that might be mentioned that are well adapted to soil and climate conditions of many of the counties in Pennsylvania.

I fail to find any mention of Rome Beauty on your fruit lists. Just why you have omitted this is a question I cannot solve. In my estimation it should rank with York Imperial, and though not so prolific, it comes into bearing early and its quality is better than York Imperial; and it is the ideal apple tree for sandy soils.

The question of varieties to plant is one of paramount importance. In times past little attention was paid to this matter, but in recent years it has been the subject of very careful investigation. It was partly for this object that the American Pomological Society was organized. And for this purpose, by means of extensive correspondence with fruit growers all over the United States and Canada, data has been obtained upon which the Pomologist of the Department of Agriculture at Washington has been enabled to publish in pamphlet form, a list of varieties of fruit adapted to the various sections of the United States and Canada. It is known as the Revised Catalogue of Fruits and the publication is revised from time to time in order to keep pace with the progress in Pomological Investigations.

I cannot urge upon your growers too strongly the necessity of planting varieties adapted to your soil and climate. If mistakes are made in cultivation, spraying, pruning and such things, they can be corrected the following year, but if mistakes are made in the selection of varieties it means a loss of seven or eight years' time which no one can afford to lose in the short space of a life-time.

A mistake very often made is in planting too many varieties. Four or five of the very best sorts that have been tried and known to succeed in the locality where the planting is to be made, are sufficient for a commercial orchard.

According to the Census of 1900, Pennsylvania is one of the great apple-growing states, ranking third in total value of all kinds of fruits. It is probably safe to say that there is not a county in the State of Pennsylvania in which some kind of fruit cannot be grown with profit. It is needless to state here the different kinds of fruit that can be profitably grown in the different sections of Pennsylvania. You can decide better by what has succeeded best in any locality, what is likely to be the moneymaker in a given section. Since the Census of 1900 when Pennsylvania ranked second to New York in her apple crop, great changes have taken place, and more attention has been paid to up-to-date methods of orcharding.

A new interest in orchard growing has been awakened. Hitherto a large percentage of the fruit crop came from the home orchard or small commercial planting; now under the new impulse large plantations are being started and Pennsylvania is keeping pace with her sister States in the great movement, and her possibilities, it is safe to say, are unsurpassed by any of them, but

if she would keep up with the procession she must adopt the improved methods of the times, in all the details of culture, pruning, spraying, thinning, harvesting, grading, packing and marketing the fruit.

Intensive versus extensive culture is the watchword. Eternal vigilance is the price of good fruit. The old method of planting an orchard and trusting to providence to take care of it is a thing of the past. Much depends on the man behind the enterprise. Success in fruit growing is not the result of chance or accident. It means the exercise of brain and muscle; it means business in every sense of the word.

However much you have done in fruit culture, recent statistics show that your orchardists fall far short of growing sufficient fruit to supply the great home demand, and large quantities are shipped in from other States. With this condition existing and with the wonderful possibilities of fruit growing in Pennsylvania, it seems to me that there never was a time in the history of the industry so favorable for orcharding as at the present, when viewing this subject from a commercial standpoint.

With the favorable climatic and soil conditions of Adams, Berks, Lehigh, Lancaster, Lebanon, Montgomery, York and other fruit growing counties of your State, and with such fine markets as Pittsburg, New York and Philadelphia right at your doors, there is every incentive to further the progress of fruit growing.

Next to the long list of apples that originated in Pennsylvania comes the list of pears consisting of fifty-two varieties of which the most valuable variety of all is the Seckel.

Your Horticultural Society is one of the oldest, having been organized in December, 1827; since then nearly all of the territory west of the Mississippi river has been settled and made into States whose populous cities teem with varied industries.

Your Society has on its roll of honor such names as Meehan, Landreth, Hoopes, Warder, Barry, Fox, Wilder, Parsons, Parry, Thomas and other distinguished pomologists, many of whom have passed to the Great Beyond. I would urge the young men of your State to take up the great work so ably begun by these illustrious pomologists for orcharding is a pleasant and profitable occupation.

To go back to the exhibit over here, I have not had time to make the notes I would like. My time was so taken up judging the fruit that I did not have the time to make the notes I wanted. In looking over the county displays, Perry, Adams and Luzerne have wonderful displays of almost perfect fruit—especially Adams. I trust you will pardon me if I make any personal allusions. Adams County makes the best display of any county. There is scarcely an imperfect specimen there in the way of the coddling moth.

Lewis Brothers, of Luzerne County, have one of the most remarkable exhibits in the hall. Every one can see the fruit for himself, and know what it is by the label. This exhibit was not in competition with the others, but it is a noteworthy exhibit.

In some of the exhibits I find the Spitzenberg, which used to be grown years ago, but has lately been dropped almost entirely. It is a high quality, and very valuable.

There are four boxes of apples over in the hall that come nearer perfection in grading and packing than anything else there.

I find some varieties that, perhaps, have not been tried, but of the tried varieties, there is the Rome Beauty, growing in many parts of the country. In Ohio, where it originated, it has become nearly perfection, and judging from the specimens I see over here, it will become one of the leading varieties of this state. Next comes the York Imperial.

By the way, I must not pass by a very fine exhibit of pears, sent in by your worthy President. He says it is due to cross-pollination. That is something that has never been fully established before, but if this is the effect, it is something to know and make use of.

The Banana apple, which is coming into notice, originated in Indiana, from there into Michigan, and from there into the Northwest, seems to be doing as well here as out there. It is quite a choice variety, and I hope to hear further reports from it.

There is one thing that I wish to call your attention to in regard to the Jonathan. There is a disease which has lately shown itself in the way of spots on the skin; they are only skin deep, but it detracts from the market price of the apple. They do not know yet exactly what it is. The first time my attention was called to it was when a man came clear on to the city of Washington from the state of Washington. He had sent a carload of fruit there. It was sent by the way of Pittsburg and distributed through a commission house at Washington, and he received complaint of these spots, which it was supposed had developed while in storage. They showed me some of the specimens, and my impression was arsenical poison, which did not show itself at the time, but developed while the fruit was in cold storage. I find among your apples quite a number of specimens affected in this way.

Now, you are aware that there has been a tremendous impetus given to fruit-growing throughout the country. I think that Pennsylvania is to-day quite close up with other states. I have been watching this impetus, especially in connection with Virginia and West Virginia, and I suppose you, in your state, are doing the same thing. Now, I don't want to hurt your feelings any, as fruit growers, but I want to tell you that you have not yet attained to the high water mark in fruit growing. Now, if you will look over the display you will find a number of specimens that could have been improved by spraying, and you will find this, especially, in parts of the country where they have not had any education along this line. Then, in grading and packing you fall short. There is scarcely a box or a barrel on exhibition that would stand the test of the Hood River district. Out there they have specialists to do their packing. No man is allowed to do his own packing, so as to detract from the uniformity of the fruit. It is quite an art to pack fruit properly and carefully and nicely. Now, if you will go

over and look at the boxes there, and then at Lewis Bros. box, you will see the difference. Some of the boxes are not more than two-thirds full, and in no way can they come under the head of first-class packing.

Then there is another thing you will have to have your attention called to here. You spray for moth, and for the San Jose scale, but you do not prepare for frost. If you realize that the cold air settles at the bottom, you will have your orchards in such position that the cold air can escape without injuring your blossoms in the early spring. There is no telling what you may have to overcome in this matter of damage by frost. I have written out a few notes here, which, if you can spare me a little time, I will read:

Among the most wonderful achievements in the progress of horticulture in recent years is the discovery of means for the prevention of frost injury to fruit trees during and after the blossoming period. The danger to fruit trees by frost injury is not so great during winter months, but when the tender blossoms appear there are a few days in spring time when the weather is apt to be capricious.

It is perhaps safe to say that at least 40% of our crop of fruit is cut off annually in the spring of the year by frost. In some of the commercial orchard districts this disaster has occurred so frequently year after year that thousands of acres of orchard trees have been abandoned and are being cut down to give place to other crops. In this age of invention it is not wise to attempt to set bounds or limits to the ultimate power of man to overcome the forces of nature or to modify and change atmospheric conditions. There is little in the way of man's achievement that seems hopelessly impossible. Already it has been fully demonstrated that the temperature of the air can be raised a number of degrees by artificial means. Many devices for orchard heating have been invented and are now on the market.

From the abundance of testimony already obtained from reliable sources in all parts of the country, it is safe to say the prevention of frost injury to fruit crops has already passed the experimental stage and has become a well-established fact that cannot be controverted or lightly passed by. For the past three or four years practical tests have been made in Colorado and other western states, with perfect success. We have reports of many remarkable instances where thousands of dollars have been saved by the use of heaters. A single case in point will perhaps be sufficient. Mr. C. E. Mincer, of Hamburg, in reply to questions put by the Editor of the Missouri Fruit Grower in November, 1910, as to why he prepared for frost fighting, says:

"We lost several crops of fruit by frost and we either had to save the fruit or get out of business. In one year, while experimenting with means to prevent frost losses, we saved 6,000 bushels of peaches by burning brush in the orchard, and another year we saved a part of the apple orchard by the same means. The success we had with

burning brush led us to equip a portion of our orchard containing 900 bearing apple trees with 1,000 of the small size Troutman orchard heaters. We also constructed a large storage tank that would hold several tank-car loads of oil and obtained an outfit of tank wagons, buckets, lighters, etc. The concrete storage tank is constructed of reinforced concrete and holds 16,000 gallons. The tank is all below ground and over the top is arched steel bedded in cement. An 18-inch man-hole is left in the top so that it may be entered at any time when necessary. The bottom of the tank slopes to one corner where it opens into a two-inch pipe that leads down hill to a point where easy loading in the wagons can be affected. The unloading of the tank car is done by gravity and by taking advantage of the slope of the land; the handling of the oil is also done by gravity when reloading the wagons. The oil is thus handled easily and quickly.

"The orchard pots or heaters must be managed so as to light quickly. We did not try to light the pots till the temperature dropped below thirty degrees. We did this to economize on oil. However, when the temperature reaches thirty-two degrees in any orchard, the oil pots should be lighted. And, if a period of 24 or 36 hours has elapsed after the trees have come into bloom the fertilization will probably be completed.

Records of Temperature. "The first night of the frost was April 16th. On this night the temperature was at 34 at 9 P. M. At midnight it had dropped to 27; at 3 A. M. it had reached 23 degrees and at 4 A. M. it reached the minimum close to 22 degrees. Inside of the orchard where the fires were burning, the temperature at this hour was 33 degrees in some places and 32 degrees in others. Outside of the orchards the temperature did not reach 32 degrees until noon the next day. On this night the wind was blowing so hard that it was difficult to pour the oil from the buckets into the pots. It must be poured into burning pots slowly or it will put out the fire. And to make the work doubly difficult on this night it was snowing hard and the melting snow in the pots caused the oil to sputter and pop from the pots, wasting a great deal of it.

"On Thursday night, April 21st, we had the most convincing test of the value of smudging with oil heaters. It was a clear night and still, and the temperature in the evening dropped to 28 degrees, reaching a minimum of 25, where it remained until 9 A. M. the next day. We lighted one-half the pots and watched results. A dense black smoke formed over the orchard and surrounding fields. The temperature outside of the orchard was 25 degrees and inside it was 36 degrees. Outside the orchard everything was covered with thick, white frost, while inside the trees were dripping wet with moisture.

In all we burned the oil pots nine nights, and the time ranged from five hours to twenty hours in each twenty-four. At the last the temperature would drop about four o'clock in the morning to freezing point and frost a little. We would light about one-third of the heaters and let them burn until past the danger time.

"The expense of heating the orchard this past spring was approximately 7 cents a bushel for the apples harvested. This includes the expense of equipment for the work, building the oil storage tank, the tank wagons, lighters, pots, buckets and enough ready oil on hand to fight another season of frost equally as bad. So that the actual cost the past season was far below the 7 cents mentioned.

"The cost of this protection is so cheap compared with the returns that it is absolutely folly for the fruit grower not to be prepared. The type of pot used was the Troutman, which was selected after much investigation from a number of sources, and we doubt if we could have made the successful fight with any other kind of oil burning pot."

There are thousands of acres of good orchard lands in your State and the awakened interest in fruit growing among your people will result in that successful orcharding that tends to make happy homes and increased revenue.

It is a great pleasure to me to meet with you and see what you have been doing along this line. I like to keep in touch with the fruit growers all over the country. Last week I was judging at the Ohio apple show, which, by the way, was a wonderful show. Last fall I was at Denver. As you know, that is one of the finest fruit-growing countries in the world, and fruit growing has become one of their most important interests. Some of the fruit I had to judge out there was what they call "jumble-packed." They put in a layer at the bottom, then put in the apples, with another layer on top. Every section has its own methods, but eventually they will all have to adopt the methods of the Northwest. The buyers demand it. I will give you an instance of this. A grower of Virginia who grew some very fine Winesaps, shipped some of them to New York, packed in boxes the same as they do in the Northwest and the dealer wrote him that if he had left his name off the box, he would have sold them for Northwestern fruit.

Now, I have said enough on this subject. I know the next time I come here I will find still further improvement in the growing of your fruit—in the spraying, in the pruning, but especially in the matter of grading and packing, which is one of the most important things. It is better to keep at home all your imperfect fruit. It detracts from the value of your fruit if sent to market. You, perhaps, think that all the Western fruit is like that you see here. It is not so. What we see here in the East is perhaps not one-half of their fruit, but they can not afford to pay freight on their imperfect fruit. You are 3,000 miles nearer the market than they are, and I think that going to the West is a step back-

wards. Within the last few weeks I have had three inquiries from Western men who want to sell out their fruit land and come East to raise fruit. They ask me where they can find a good location. There are still large sections here in the East, particularly in Virginia and West Virginia, that can be profitably used for fruit growing, and I suppose it will be so for some time.

The President.—We are indebted to Colonel Brackett for the very hard work he has been doing for us.

A Member.—I would like to ask the gentleman what it costs to heat an orchard?

Colonel Brackett.—Seven cents a bushel, with all the outfit; the next year, with your outfit already on hand, the cost will only be half as much—not more than two or three cents a bushel.

The President.—The members of the Pennsylvania State Horticultural Association have a very friendly feeling towards State College; in fact, we have begun to lean on it. I noticed Dr. Sparks, the President of State College, coming in a few minutes ago, and I want to ask him to say a few words to our Association.

Dr. Sparks.—Ladies and gentlemen who are interested in horticulture: I want, first of all, to congratulate you on your interesting meeting, and on the exhibit you are making here. I went in last night to view the exhibit, and I not only profited mentally, but I also profited so far as the Department of the Interior was concerned. The fruit there would certainly be a credit to the State of Washington.

Now, it has been said frequently, that many things are lost because the people do not go after them. That is something State College can never be accused of; we are going after things. Twenty-five years ago State College was known as a place where the boys and girls went and came away. The college is usually judged by what comes out of it. That is hardly fair, because it is impossible to take poor stock and make good stock out of it. You must have a good foundation to begin with. To-day State College stands for achievement, and nothing shows it better than the increase in value of property up there. To-day you people have about \$2,000,000 worth of property at State College, and you are just beginning to find out about it. You want some interest on your investment. In earlier days the father sent his boy to college because he expected to get some return from him; he did not always find it necessary to send the girl, and many sent neither the boy nor the girl. Now the boy and the girl have a right to the college, and if they cannot go to the college, why the college must go to them. So demonstrators have been sent out everywhere throughout the State to show the people the things that have been worked out at the College.

You people here are more interested in the development of fruit trees than anything else. The United States gives \$30,000 each year to this state, every penny of which must be spent in agri-

cultural experiments. In working out how to get these experiments to you people, the old method used to be to issue bulletins (we still issue them), but usually the farmer put aside these bulletins to be read at his leisure in winter, and so did not have the principles to apply to his work in the summer; when the next summer came along, many of them had been forgotten. Now, the best thing is to come up to State College and get your education there, but for those who can not do that, the next best thing is to carry the experiments out to the people by actual demonstration. In order to do this, we must have money; money to take care of the six hundred boys and girls who come up to us at State College to learn the science of agriculture; money for the demonstrators who carry the college out to the people. Most of you have received this little leaflet which I hold in my hands; if you have not, it is not our fault, because we want you to have it badly enough. It simply tells what the college has done in the way of sending out bulletins, in the way of corn growing and judging contests, and in the way of personal demonstration. Three hundred addresses were delivered last year, reaching at least fifty thousand people. In addition to this, we have the short course, the Farmers' Week, and the correspondence course. In order to do these things, we must have money, and we expect to go before the Legislature and ask for an appropriation that will enable us to carry on these things. Your President should not have asked me to the platform if he did not want me to speak of these things and ask your co-operation. I am pleading for the college, and for the 1,750 boys and girls we have enrolled there this year, and also for means to enable us to bring the college out to you who cannot come up there. We are asking for an appropriation of at least a hundred thousand dollars to bring it out to you. If we can only save one life it is worth a hundred thousand dollars, and it is your college. I hope you will excuse the demand, and the earnestness of the demand from you, the people; it is your college, and we want you to do all you can do for your college; give us your best co-operation and assistance in the work that is being done for you.

The President.—I want the Chairman of the Fruit Show Committee to read the award of prizes. Will Prof. Wright please report.

Prof. W. J. Wright, Chairman, presented the following report of the award of the prizes:

CLASS I.—*Single Barrel.*

- (1) Tyson Brothers, Flora Dale.

CLASS II.—*Three Barrels—Three Varieties.*

- (1) William Stewart, Landisburg.

CLASS III.—*Single Box.*

- (1) B. F. Wilson, Aspers; (2) Tyson Brothers, Flora Dale;
(3) D. M. Wertz, Waynesboro.

CLASS IV.—*Three Boxes—Any One Variety.*

- (1) Tyson Brothers, Flora Dale; (2) A. C. Richards, Shellsburg; (3) Daniel Rice, New Bloomfield.

CLASS V.—(*Pratt Cup Special*)—*Three Boxes of Three Varieties.*

- (1) Tyson Brothers, Flora Dale; (2) Wm. Stewart, Landisburg.

CLASS VI.—*Single Plates.*

Arkansas (Mammoth Black Twig).—(1) D. M. Wertz, Waynesboro; (2) A. D. Strode, West Chester.

Baldwin.—(1) L. M. Myres, Siddonsburg; (2) R. M. Eldon, Aspers; (3) Tyson Brothers, Flora Dale.

Ben Davis.—(1) D. G. Minter, Gettysburg; (2) S. L. Brinton, West Chester; (3) B. F. Wilson, Aspers.

Fameuse.—(1) E. F. Kaufman, York.

Gano.—(1) D. M. Wertz, Waynesboro.

Grimes.—(1) R. M. Eldon, Aspers; (2) D. M. Wertz, Waynesboro; (3) S. L. Brinton, West Chester.

Hubbardston.—(1) H. M. Keller, Gettysburg; (2) D. M. Wertz, Waynesboro; (3) A. C. Wright, Hummelstown.

Jonathan.—(1) D. M. Wertz, Waynesboro; (2) R. M. Eldon, Aspers; (3) A. C. Richards, Shellsburg.

Northern Spy.—(1) F. H. Fassett, Meshoppen; (2) J. C. Henning, N. Mehoopany; (3) H. B. Howe, Wellsboro.

Rambo (Winter).—(1) Wm. Stewart, Landisburg; (2) Rufus Lawver, Biglerville.

R. I. Greening.—(1) A. C. Richards, Shellsburg; (2) J. C. Henning, N. Mehoopany.

Roxbury.—(1) E. F. Kaufman, York.

Smokehouse.—(1) Wm. Stewart, Landisburg; (2) H. B. Cumbler, Logania; (3) E. F. Kaufman, York.

Stayman.—(1) Tyson Brothers, Flora Dale; (2) L. M. Myres, Siddonsburg; (3) E. P. Garretson, Aspers.

Summer Rambo.—(1) Tyson Brothers, Flora Dale.

Tompkins King.—(1) A. C. Richards, Shellsburg; (2) H. B. Howe, Wellsboro.

Wagner.—(1) A. C. Richards, Shellsburg; (2) H. B. Howe, Wellsboro; (3) Wm. Stewart, Landisburg.

Winter Banana.—(1) Wm. Stewart, Landisburg; (2) H. M. Keller, Gettysburg; (3) G. E. Stein, East Prospect.

York Imperial.—(1) E. F. Kaufman, York; (2) Tyson Brothers, Flora Dale; (3) E. P. Garretson, Aspers.

York Stripe.—(1) Wm. Stewart, Landisburg; (2) H. M. Keller, Gettysburg.

CLASS VII.—*Largest Number of Varieties.*

- (1) H. C. Snaveley, Cleona.

CLASS VIII.—*Collection—Three Plates.*

Ellwanger and Barry Special.—(1) Tyson Brothers, Flora Dale; (2) J. A. Cocklin, Siddonsburg; (3) Wm. Stewart, Landis-

CLASS IX.—Collection—Three Plates.

Edwin C. Tyson, Pruning Special.—(1) A. C. Wright, Hummelstown.

CLASS X.—Collection for the Home Orchard.

Edwin C. Tyson, Harvesting Special.—(1) S. L. Brinton, West Chester; (2) A. C. Richards, Shellsburg; (3) Wm. Stewart, Landisburg.

CLASS XI.—Collection—Five Plates.

(1) S. L. Brinton, West Chester; (2) A. C. Richards, Shellsburg; (3) J. A. Cocklin, Siddonsburg.

CLASS XII.—Plate "Delicious" Apples.

Stark Brothers Special.—(1) E. F. Kaufman, York.

CLASS XIII.—Box—Jonathan Apples.

Stark Brothers Special No. 2.—(1) A. C. Richards, Shellsburg.

CLASS XIV.—Single Plate—Five Varieties.

Friend Mfg. Co. Special.—(1) Tyson Brothers, Flora Dale; (2) B. F. Wilson, Aspers; (3) A. C. Richards, Shellsburg.

CLASS XVI.—Nuts..

Section A (English Walnuts).—(1) J. G. Rush, West Willow; (2) Wm. Stewart, Landisburg; (3) L. C. Hall, Avonia.
Section B (Black Walnuts).—(1) Wm. Stewart, Landisburg; (2) J. W. Sheibley, Alinda.
Section E (Butternuts).—(1) J. W. Sheibley, Alinda.

CLASS XX.—Sweepstakes.

(1) Tyson Brothers; (2) Wm. Stewart; (3) A. C. Richards.

CLASS XXI.—County Association Trophy.

(1) Adams County; (2) Perry County.

The President.—It may be well to announce that at the close of this session there will be a "Good Roads" meeting right in this room, at which the Governor has consented to be present, and for which you are all invited to remain.

Mr. Engle.—After hearing this report, I move a vote of thanks to Colonel Brackett.

This motion was seconded and unanimously carried by a rising vote.

Col. Brackett.—It is very gratifying to me to see so many of you rise for that vote. I expected no such appreciation. I thank you.

Mr. Fox.—As one of the oldest members of the Society, I want to say that I think we are indebted to Col. Brackett for his work in judging the display. I don't think there is any one who has been a member of this Society longer than I have. I became a member in 1870, so that I am forty-one years a member. I am glad to see the young men come in and take such an active interest.

In regard to State College, we are glad to hear the earnest words of Dr. Sparks. In 1871 I first went to State College; I was a trustee for twelve years, under Dr. Atherton, together with our President, Mr. Hiester. Ten years ago we had hardly a single member from my own county of Berks. To-day we have forty-eight in the institution, and a number of alumnae, and the same reports are coming in from all over the state. It simply shows the impetus that is being given to fruit growing all over the state. A year ago I was with the Orchard Train for three weeks, through twenty counties of Pennsylvania, and we could see the awakening. At eighty meetings we had more than two thousand people turn out to meet this train. At one place, Selinsgrove, five hundred people stood all afternoon in the slush and rain. Then State College had its orchard train out, and to-morrow the "Goods Roads Train" will start. All these are bringing an education and an uplift to the people of this State.

I am certainly proud of this crowded room. I know the time when our friend Hiester and myself came to very slimly attended meetings, but we have now reached the stage where we are proud of having our friends from Ohio and New Jersey and New York and Connecticut come in to see us, and we are proud of our Association.

Mr. President.—Is Mr. Fassett in the room? We want to know why Wyoming has not sent a county exhibit to this meeting.

Mr. Fassett.—Mr President, Ladies and Gentlemen: I hardly know what excuse to give to the President and members of this Society.

I feel that the coming of the Association to our county last winter has conferred on the people a lasting benefit; the people of Wyoming County are doing things. We are growing fine apples even if we have no county exhibit here to-day. There are a number of exhibits here from Wyoming county, but no county exhibit. I want to say to you, however, that Wyoming County is coming to the front as an apple county; and I believe that the coming of the Society to Wyoming County last year is one of the things that is going to help to boost us in growing apples. Our County Association will meet at Tunkhannock next week and exchange views on apple growing, and at the next meeting of the State Society, I think Wyoming County will be a competitor of Adams County for the prize for county exhibits.

The President.—Mr. Fassett is excusable. He took the first prize for Northern Spy, and has been away doing Institute work, so he is excusable.

The Secretary.—Mr. President, I think we can excuse them because I can report as Secretary that Wyoming County has come up better with renewals than any other county.

The President.—That speaks well. If Mr. Zimmerman is in the room, we would like to know what they are doing out in Somerset County. I helped to organize that Society.

Mr. Zimmerman.—Mr. President, Ladies and Gentlemen: It gives me great pleasure to be able to meet with all the prominent apple growers of the State of Pennsylvania.

I didn't come here to make a speech; I am only a small grower, with fifteen or eighteen acres, but I am just beginning. We grew apples out in Somerset from the time of our grandfathers, but it is only in the last ten years that we have learned how to cultivate them, the same as many others here. I would rather grow apples in Pennsylvania than out in Washington or Oregon. There is no reason why we cannot grow better apples here than they grow out there. We have better soil, better climate, better markets—everything but a better color. Pennsylvania is a great apple state, and I don't believe it will be long before we will be shipping apples by the shipload or the trainload to foreign markets. We can't do that now simply because we have not got the apples.

I am here from Somerset County; we are taking a small, but active part. We are like the blossoms on the tree, just beginning, but I think we are willing to do our part in building up the State Association, and if you people will do your parts, we will try to help you along, so that we may become a community of apple growers and apple shippers, and make Pennsylvania all we can desire.

The President.—Now we would like to hear from Franklin County, the next neighbor to Adams County. Where is Mr. D. M. Wertz? Is there any one here to stand up for Franklin County?

Mr. Ledy.—Gentlemen, I am here to stand up for Franklin County.

The President.—Mr. Ledy, one of the largest peach and apple growers is ready to stand up for Franklin.

Mr. Ledy.—I just came into the room in time to hear you call for my friend and neighbor, Mr. D. M. Wertz. He was in the room a few minutes ago, but I think he has just gone out, but I am here as one of the standard-bearers of Franklin County. I believe that we have shown at Philadelphia, and are showing here at Harrisburg that the State of Pennsylvania can raise fruit that is infinitely better than anything the West can produce, and I believe we will be the peer of any State in the United States ere long. We are growing, up in the Cumberland Valley, a little better fruit than anywhere else in the state, and a little more of it. I am blowing my own horn, but you will have to excuse me. We are growing a

little better fruit than the other fellow, and a great deal better fruit than the Western fellow. Let us be united, and make Pennsylvania the Excelsior of the Union in fruit growing. We can do it. We have the natural conditions that will enable us to do this if we only use our brains and muscles, so let us do that.

Mr. Black.—May I say another word? You called on Mr. Wertz a few minutes ago. I have in my possession a card of "D. Maurice Wertz, grower of peaches and apples" and I want to say that at the New Jersey meeting he came nearer scaring the New Jersey people than any other fellow there. He had some beautiful apples there, and the judges reported that they were sorry they could not give him a prize because he was out of the state. You need not be anxious about Franklin County if Mr. Wertz lives there.

WEDNESDAY EVENING, JANUARY 25, 1911.

The State Live Stock Breeders' Association, the State Dairy Union and the State Horticultural Association met in a joint banquet at the Lochiel Hotel. An attempt on the part of the hotel people to handle a crowd far beyond their capacity, resulted in delay and a very uncomfortable time in the dining room.

Toasts were responded to by Governor Tener as a guest and by representatives of the three associations in short speeches, full of force, each in his own way—and spicy. Thus what the occasion lacked in physical food was more than made up in the mental treat afforded.

THURSDAY, JANUARY 26, 9 A. M.

President Hiester in the Chair.

The President.—The first business this morning is the consideration of a new Constitution. Our Constitution, written thirty or forty years ago, does not seem to meet present conditions; we seem to have outgrown it. In the interval between the sessions, I appointed a committee to go over the Constitutions of other State societies, and pick out what they considered wise for our own use. Your Committee did their work, and drafted a plan which they presented at a joint meeting of this committee and the Executive Committee, and with a few changes it was approved by the Executive Committee. I will ask the Secretary to read the whole of the proposed new Constitution and then it can be acted on by the Society, as a whole, or section by section, as preferred.

The Secretary thereupon read the proposed new Constitution and By-Laws as a whole.

On motion, it was taken up section by section and fully discussed.

The matter of dues received special consideration. A few members feeling very seriously that the dues should be raised to three or even five dollars annual and twenty-five dollars life. Others were equally serious in feeling that the time was not ripe for a change in the dues.

A few minor changes were made and the Constitution and By-Laws printed in the early pages of this report were finally adopted.

The President.—The next thing in order is the appointment of a Nominating Committee.

The following gentlemen were named by the house, and the appointment confirmed by the President: D. E. Murray, W. J. Lewis, F. H. Fassett, E. B. Engle, Josiah W. Prickett, R. J. Walton and Abram Hostetler. Mr. Engle was made chairman.

ORCHARD MANAGEMENT.

By W. W. FARNSWORTH, *Waterville, Ohio.*

When I first began thinking of horticulture, and began to plan changing over from general farming to fruit growing, I was doing considerable work in the woods. I have always been a lover of trees, and a lover of the soil, and I realized that this new ground when the plow first went into it, was rich in humus, and when I compared it with the richest land I had for fruit growing, I saw the difference; I realized the difference, and I realized that it was due to the difference in humus. Then I read a pamphlet by Dr. Harlan on "Farming with Green Manures," and I began to look around me, and saw the farmers growing clover, without putting manure on the soil, and I soon found that soil to be more productive than other soils. Then I learned that the clover made the soil rich, made it darker and raised the temperature of the soil, putting in it the moisture and the humus, and the plant food that is so deficient in the old soils of our country. There is no pleasure in farming a poor soil. I have always been a humus crank, and am growing worse and worse from year to year. It seems to be a hopeless case. Probably the best I can do in my limited time, is to tell you of some of my work. I feel there that I am standing on solid ground.

I grow a general line of orchard crops—strawberries, cherries, currants, apples, pears, peaches, and plums, and I grow some of the ordinary farm crops, mostly as a feeder to my orchard. I also grow a great many small fruits and vegetables. We have been growing berries quite extensively. We find that we can keep a clean and healthy tree by cultivating the small fruits under it until the tree gets nearly to the bearing age. I have thousands of strawberries and currants growing in my orchards, and I find this a very satisfactory and profitable method.



MR. FARNSWORTH'S YOUNG ORCHARD WITH COVER CROP.

The first thing is to get an orchard site that is free from frost damage. We want frost drainage. I am about twenty miles south of Lake Erie; then we have, again, the Valley of the Maumee River, which is thirty or forty feet lower than my farm, and these things seem to give us protection to a large extent, against the frost; in fact, we have been very free from frost, having but one severe loss from frost in the last twenty-three years.

Having selected the ground, the next step is to see that it is well underdrained. In my own case, we lay tiles three or four feet deep and 80 to 100 feet apart. Some people claim that good fruit soil should be naturally drained, but I have found the tile drainage to work very well in my peach orchards.

I like to start an orchard by using a hoed crop first. I put in a hoed crop, and then plant the orchard. I have been doing a good deal of fall planting, mostly apple, pear and plum; we are usually so busy in the spring that it is hard to get our tree planting done. Until lately, we have not been doing much with the one year old trees. My preference has been to get a two-year-old tree. Most of my orchards are planted twenty feet apart each way on the filler system, for which purpose I have used apples. I have a great many early varieties, and I prefer to use them in part. Some growers have been very successful with peaches, as a filler, but I have preferred not to mix my varieties, and have used the apples, chiefly of the early bearing varieties, such as the Yellow Transparent, Oldenburg, Jonathan or Rome Beauty, all of which do very well with us. You can hasten the bearing of these filler trees by proper methods. In the case of the apple, I like fall planting, and in spring planting I want to get them in just as early as possible after the ground is ready. After I have planted the tree in the fall, I top work it the following spring. I prefer the Northern Spy for a

stock and have used the Ben Davis. I always like to cut the scions in the early winter and keep them as nearly as possible in a dormant condition; in short, just as with anything else, don't let them get too wet or too dry. Then after the trees get well started, and the buds come out, we do our grafting, and we get better results by working this way. The general practice is to wait a year before doing any grafting, but I am satisfied that you lose time by it.

We start about 20 inches from the ground, and use a single scion. We shave off one corner in putting in the scion, and we get a good deal better results in healing over in this way.

Now, I have practiced it for fifteen years, and while I have no data to show that I have secured any better fruit by selection, I believe that I have gotten better results than if I had not practiced it. There are several things that go toward producing early bearing, but I believe this top working is one of them.

In the matter of pruning, my maxim is that pruning is a necessary evil. It is impossible to get a tree that does not require any pruning, but every limb that is cut off takes that much from the tree. I head my trees about 20 inches from the ground; the Rhode Island Greening we do start out a little higher, but our principle is to keep the trees down as low as possible, because with the present day implements, one can cultivate close enough. It may look a little better to cultivate to within an inch or two of the tree, but in a year or two it does not matter, and you are avoiding a large, high tree.

Then we plant in the orchard, potatoes or currants or strawberries. There are some objections to strawberries; the first year it is all right, but the second year they rob the orchard of some moisture. We seldom pick our strawberries over one year, and the latter part of June, the apple orchard is ready for cultivation.

The first four or five years we grow vegetables or small fruits. We take them out when the tree gets into bearing, and then we plow up the ground and grow cover crops. It is not safe to have any hard and fast rule; a good general must be able to change his plans over night. We use soy beans, or perhaps cow peas would do as well, but we use the soy beans, because we can cultivate by team, and they add humus to the soil. I know of some growers who allow the hogs to go into the orchard and gather up the soy beans, but my own practice has been to let the beans go to the ground, and turn them in. Then, I like crimson clover. We have one orchard, about eight years old, just coming into bearing; we got about a bushel per tree this last season. In this we have grown clover, leaving it mulched around the trees, and then the following spring, turned it in again. Another cover crop that we use very largely is the sand vetch. One objection to it is that its growth takes place in the spring, and thus prevents cultivation, and takes up the moisture that is required by the tree. The vetch, however, seems to take up an immense amount of moisture and retain it in the soil. It is better in this respect than the rye. Mr. Powell recommended crimson clover, but it is not so hardy with us as vetch. We find in cases where the vetch had been planted that we secured twenty

bushels more potatoes than where we had grown clover. We like to sow the vetch in July, to get the best results, although we have sown it as late as September, and still had good results. It lays quite low on the ground, and is very convenient to work around because it is not high, and it makes a wonderful growth.

Now, after the young tree has been shaped, we try to do just as little pruning as possible. I think we often delay the bearing time of our young orchards many years by unnecessary pruning of the horizontal limbs. I know, in my own young orchard, years ago, I explained to my foreman what I wanted done, and he said it didn't look right to him. I gave him permission to do as he thought best, but on my side, I carried out my theory, and in a few years, we saw the good results of it. We will have to be a little more sparing in our use of the knife. We will have to learn from our wiser friends. We are just in the kindergarten stage of fruit growing. A few years ago when the Western men began to ship in this fine fruit, and our orchards were attacked by the San Jose Scale, we became discouraged, but we find that we can grow just as fine fruit as they do in the West, and the Good Book says that "God gave man dominion," and that must include the San Jose Scale and everything else. In fact, it has been the best blessing we have had. It has been a little hard on the small grower, but it has put thousands of dollars in the pockets of the commercial grower. Let us spray more freely, and we will not have to do so much pruning. Of course, that does not apply to the peach trees, which need more pruning. The apple, the pear and the plum need very little thinning. Many have said that the sour cherry needs but little thinning, but I find it needs about the same as the apple does. We do our pruning in the fall, winter or spring, any time after the leaves fall off.

In the manner of cultivation, we believe in early cultivation in the early life of the tree. In the second stage—the orchard may be divided into three distinct stages—it is when we grow cover crops we are growing fertility right there in the orchard, and the third stage, when the trees begin to occupy the ground completely, we depend on hauling in all the vegetable matter we can get—leaves, and straw, and manure or anything that will rot and become vegetable matter.

In regard to spraying, I hesitate a little to give you my methods of spraying, but I do so, to show you what can be done under favorable conditions. We have only been spraying twice a year. Perhaps you will say we don't get results, but as a statement of what we get, at the last Ohio show, the best we have had in Ohio, with a carload and a half of fruit on exhibition, we got thirty-nine prizes, thirty-six first and three second, out of forty-three exhibits. That was secured by spraying twice. Now, don't go home and do this, and lose your fruit, and then say I advised you to do so. We have been spraying for the past twenty-five years. We spray once, just before the blossoms come, with lime and sulphur, and then once when the blossoms fall. We reach the tree from four or five different sides. We never consider a tree sprayed until it is sprayed

from both sides, with the wind blowing that way, and we do thorough work. The Experiment Station did some thinning in my orchard, and Prof. Green said there was less than one half of one per cent. of sprayed fruit that showed any signs of any disease or worms. That was not because of two sprayings alone but because we have been spraying for twenty-five years. In the Southern part of the state they have Bitter Rot and must spray more, but we have not had any trouble with it in our part of the state.

The next thing I want to talk about is thinning. It is impossible to grow a high grade of fruit without thinning. You will have nubbins. Suppose you have a tree bearing a thousand apples: is it more work to pick five hundred apples in July and five hundred in October than to pick them all at one time? That tree will be in better shape and you will get a better price for your fruit by the two pickings.

When my orchards were beginning to come into bearing, I began to look around among the commission men. One of them told me he had bought fruit in one year from a hundred and ten orchards, paying an average price of \$1.00 per barrel, but by the time the storage, the freight, and the commission, etc. were added, those apples must retail in winter to the consumer at \$1.00 per bushel. The result was that when I started in the business, I put up my own storage house. Then I went to the leading grocers of the nearby towns and showed them my samples. Now I make it a point to have something a little better than the Ben Davis to offer. I have never used the Ben Davis apple in my life, until last year I planted a thousand of them and top worked them. We arranged that I was to ship these apples on telephone orders, and then I said "we had better speak about the price." He said "you set your own price, and I will add a little profit to it for myself, and that will make the selling price." I have always set the price on everything that has gone out of my orchards. You want to be sure not to rob your customer the first time, and then he will come back. I have people come twenty and thirty miles in their automobiles to buy their fruit direct from the orchard. By dealing direct with the consumer, you can establish a very profitable and desirable class of trade. Our own home-grown fruit is always to be preferred to the Western fruit. Then, about the other side, why pay a dollar and a half to two and a half a bushel? Apples at a dollar a bushel are high enough to give us a splendid profit, and yet leave the fruit within reach of the average consumer who cannot afford to pay these exorbitant prices.

I have spoken principally about apple orchards, but many of the methods apply equally well to other fruits. With the cherry, our method is about the same, with the exception that we can start cultivation a little earlier. You hear about cherries and peaches wanting a thin soil. That is all nonsense. They must have a soil that will feed them, just the same as the other fruits. In the peach orchards, we attack the curculio by spraying when the spring comes, and we also spray for the plum rot, and in our orchards they have been practically overcome by spraying.

I think I have about covered the necessary points. When I see the progress we have made in fruit growing, I think the outlook is better than ever.

A Member.—How about your cold storage?



MR. FARNSWORTH'S COLD STORAGE HOUSE.

Mr. Farnsworth.—Thirty by forty, inside measurements, built of concrete blocks. Inside of that we have a two by two studding, with building paper, then another two by two with plaster. If building again I would prefer a double wall of concrete blocks. Then we have our ice boxes overhead. The apple room is 14 feet high; then above is our ice box about twelve feet wide and thirty feet long. We put the ice in before we put in the winter apples. The Grimes Golden is the first apple we put in. We drive right in with our fruit. We can keep it in fairly good condition. We have an outside packing room. We pack them ready for market in 20-pound baskets, with a little pink label, bearing our trade-mark—a four leaf clover, and that is the guarantee that the fruit is all right. We never have to solicit a customer. Our basket on the sidewalk makes all the announcements necessary. Most of our fruit goes to Toledo, fifteen miles distant, to which we have a splendid trolley service. These baskets would not do very well for long shipments, but for local shipments, we have no trouble with them.

A Member.—I would like to ask concerning the summer spray of lime sulphur and arsenate of lead. Do you combine them?

Mr. Farnsworth.—Yes, sir; a few years ago the chemists said we could not combine them, but we practical men have done so, and we find we get better results than by the use of either alone. It

mixes to a little sticky mixture, which we have no trouble in cleaning from the pipes by dipping them in vinegar.

A Member.—Tell us how you bring about early bearing.

Mr. Farnsworth.—Well, it is largely a matter of variety, and largely a matter of pruning—early pruning—and largely a matter of top working I think these are the three things that have the most influence.

Dr. Mayer.—Are your scions for top working taken from bearing trees?

Mr. Farnsworth.—Yes, sir.

A Member.—How can you use apples as a filler?

Mr. Farnsworth.—We plant our trees say forty feet apart, and put apples in between. Now, my system is generally this; if you are trying any new variety, by the time you have tested it, you can take out either the new or the old tree. Now suppose I put a Jonathan at each corner, and in the centre a filler of apple. This way I get twice as many trees as I need, and when I get ready to take them out, I can take out those that are not profitable. My plan is to try to keep my labor busy throughout the year. I would rather keep eight or ten men busy all the year round, than thirty or forty men for a few weeks. I begin my apple crop with the Yellow-Transparent. We keep stock largely to keep our men busy during the winter.

A Member.—About what time do you pick your Jonathan?

Mr. Farnsworth.—Until this year, we did not pick them until we picked the Baldwin. This year we picked them after the Grimes Golden, and the Greening. We never clean up with one pick; we pick our trees some twice, others more frequently. The red apples we pick three, four and even five times. Our Greenings we usually pick at one time, but I believe it would pay to go over it twice. I have one orchard that had a pretty liberal treatment of hen manure this year; one of the men lives near it, and he has a hen house right by the orchard, and you could tell the difference in those trees forty feet away. The fruit would not take on color, and was slow to mature. It got too much nitrogen. You can overdo it. That is the reason why I add acid phosphate to the stable manure when putting it out.

A Member.—Do you have much trouble with the mice in the straw mulch?

Mr. Farnsworth.—Yes, mice and fire are the two enemies of the mulch system. We bank up the soil around the trees.

A Member.—Do you find any bad results from the arsenate of lead?

Mr. Farnsworth.—No, sir.

A Member.—Will sour cherries do as a filler for apples?

Mr. Farnsworth.—I have never tried them. On general principles I don't like to mix two kinds of fruit. The spraying comes at different times. We might want to spray the apples when the sour cherries were nearly ripe, and it would not do.

Dr. Mayer.—I understand you to say you prune at all seasons. Now, in cutting the cherry, are you not troubled with gum or bleeding?

Mr. Farnsworth.—I would not cut off large limbs at any time. We grow only sour cherries.

A Member.—How do you market your sour cherries?

Mr. Farnsworth.—We use the quart measure, or boxes, like strawberries. That is largely a question of your market. I know people who use the grape basket. We put up some of our Jonathan apples in bushel boxes but most of them in baskets because that is what the general run of our customers want. I would always study the wishes of my customers, and try to meet them.

There is something that has occurred to me, and that is, that the Eastern districts are making a mistake in trying to copy the Western methods too much. I know that our Eastern fruits are much superior to the Western fruits in quality, and once the consumer finds the Eastern fruit on the market he will not take the Western. The trouble is that there is no distinguishing mark for the Eastern fruit; the customer goes to market, gets a box of Eastern fruit, and then goes back for more of the same kind, but because there is no distinguishing mark, he is just as apt to get Western fruit, which is not so good. Now, I believe that the Eastern grower should have some distinguishing method of packing and labeling his fruit, so that there can be no confusion. It has been suggested in our State Society that we adopt a little blue label, which can be procured from the Secretary, stating that if the contents of the package were found not satisfactory, to report to the Secretary and any member who was found guilty of misrepresentation would be refused the benefits of the label. I believe that our Eastern growers should devise some separate plan by which we can protect ourselves. We can grow as fine fruit as the Western growers, and put it on the market at one half the price, and if we have the quality, we can find the market, and we should protect ourselves.

A Member.—In planting trees, do you consider the question of pollination?

Mr. Farnsworth.—I have never studied it because I plant a great many different varieties. If I were planting a big block of one kind, I would look into the question of pollination. I find it of more advantage to have a greater variety in dealing with the local market than I would if I shipped in carload lots.

A Member.—What do you find the best package for the Yellow Transparent?

Mr. Farnsworth.—We use the twenty pound basket, because we do not ship any distance. Those of us who ship to the local market find it to advantage to have an early apple; for those who ship long distances, it does not matter so much.

A Member.—Do you use a wooden cover over the Yellow Transparent?

Mr. Farnsworth.—No; we simply put on the gauze. We do not ship over twenty or twenty-five bushels at one time, and so we do not stack them very much, and so far we have had no trouble with them, shipping this way. We are trying now to devise some little basket that will hold say half a dozen, with a wire handle, that can be taken home with the fruit. We want to create a demand for that kind of trade.

A Member.—How do you fasten the netting?

Mr. Farnsworth.—We simply use a dull knife and tuck it under the rim of the basket.

A Member.—Where do you get it in quantities, all ready for use?

Mr. Farnsworth.—Thompson & Co., Chicago, I think. Any of the larger dealers can supply you with the street and number.

A Member.—Can you tell what it costs?

Mr. Farnsworth.—Bushel size about \$1.25 per 100; half bushel size about 80 cents.

A Member.—Do you ever plant field corn in between your trees?

Mr. Farnsworth.—Well, I have planted it, but I don't like it. I would much rather plant a low crop, beans or peas; we mostly plant potatoes.

A Member.—You might give us the kind of implement you use in cultivating.

Mr. Farnsworth.—In the spring, when the ground is a little heavy, we use the turning plow, but we depend mostly upon the

cutaway harrow, and follow this with the spring tooth harrow. We use a long bar so that we get close to the tree with one end, and keep the team away from the tree.

A Member.—Does saw-dust make a good mulch?

Mr. Farnsworth.—I doubt it; there is a large slat factory near us where we could get the sawdust practically for the hauling it way, but I have never thought it advisable to use it.

Just a word about cultivation; there are a number of orchardists in Ohio and New York at work on a gasoline tractor to run our harrows instead of horses and I believe it will prove to be a very satisfactory thing.

A Member.—How do you ever drive a furrow right up to the tree?

Mr. Farnsworth.—I don't always try. The best plan is to drive as close as you can safely and leave three or four feet of the tree to roots and mulch. It is very satisfactory; we get very good results that way.

A Member.—Does that seem to do well in growing peaches?

Mr. Farnsworth.—Well, I never cultivate too close to my trees in anything. I believe it is safer for the tree.

THURSDAY, JANUARY 26, 1.30 P. M.

President Heister in the Chair.

The President.—The meeting will please come to order. Is the Nominating Committee ready to report?

Mr. Engel.—Mr. President and members of the State Horticultural Association, your committee appointed to nominate officers for the coming year, begs leave to report the following names:

For President, Gabriel Heister, Harrisburg.

For Vice-Presidents.—Hon. Wm. T. Creasy, Catawissa; Robert M. Elden, Aspers; F. H. Fassett, Meshoppen.

For Secretary, Chester J. Tyson, Flora Dale.

For Treasurer, Edwin W. Thomas, King of Prussia.

On motion this report was received and adopted.

Mr. Engle.—I move that we elect the officers by ballot, and that the Secretary be authorized to cast the ballot of the Association.

This motion was properly seconded, and carried.

The Secretary, in accordance with these instructions, cast the ballot for the officers as nominated and they were declared elected.

LIME SULPHUR SPRAYS FOR THE SUMMER TREATMENT OF ORCHARDS.

BY W. M. SCOTT AND J. W. ROBERTS, *Bureau of Plant Industry, U. S. Department of Agriculture.*

(Presented by Mr. J. W. Roberts.)

Dilute Lime Sulphur Solutions for Apple Diseases.

The lime-sulphur preparations for the summer spraying of the apple have been developed not because Bordeaux mixture has not proved to be a good fungicide, but because it often injures both fruit and foliage to a very serious extent. On the fruit of many varieties the injuries caused by Bordeaux appear as russeted streaks or areas. Often, too, many of the apples are dwarfed or badly distorted. The applications made within three or four weeks after the blossoms fall are largely responsible for these injuries, which are particularly serious in a wet spring.

Midsummer or late spraying, such as that required for bitter rot, seldom russets the fruit since by that time the tissues of the skin have become more mature and are accordingly less tender. The skin of the young fruit is injured by the copper, the injured parts enlarging with the development of the apple and finally forming the familiar russet spots and streaks. In wet seasons russetting of fruit may be so serious as to reduce its market value 25% or even 50% in some cases.

Lime-sulphur preparations then, comprise the results of an attempt to find a summer spray of less causticity than Bordeaux mixture but possessing its fungicidal powers. During the past four years the Bureau of Plant Industry, and some of the experiment stations, have been conducting experiments with lime-sulphur fungicides and the results have been such as to warrant the recommendation of a dilute lime-sulphur solution as a partial substitute for Bordeaux mixture.

The Lime-Sulphur Sprays.

The lime-sulphur preparation used for summer spraying is but a weak modification of the old wash, long used as a dormant spray for scale and peach leaf curl. Concentrated lime-sulphur solution may be made at home by boiling lime and sulphur in water, or it may be purchased already made up, requiring then merely dilution to make it ready for use.

Home-made lime-sulphur solution to be used, when diluted, as a summer spray on apples, may be prepared as follows: Boil 16 pounds of sulphur and 8 pounds of lime with 10 gallons of water for about an hour, finishing with 8 gallons of concentrated solution. Then strain and dilute with water to make 200 gallons of spray. In each 50 gallons of spray there are 4 lbs of sulphur, which according to our experiments is about the right strength for apples during the growing season.

If it seems desirable to make it up in larger quantities 50 pounds of lime and 100 pounds of sulphur may be used with enough water to leave 50 gallons of concentrated solution when the boiling is done. For summer spraying two gallons of this solution should be added to 50 gallons of water. Lime-sulphur solution at this strength will control apple scab, leaf spot, and cedar rust fully as well as Bordeaux mixture and with injury which is very slight compared to that of Bordeaux.

For specific directions for the preparation of concentrated lime-sulphur at home, your own experiment station's bulletins by Prof. Stewart, contain the latest and best information. (Bulletin 99).



FIG. 1.—York Imperial tree sprayed with lime-sulphur, showing luxuriant foliage.

Numerous brands of commercial lime-sulphur for fungicidal and insecticidal uses are now to be found on the market. Most of these test 32° to 33° on the Baume spindle and for summer use on apples are to be used at a strength of 1½ gallons to 50 gallons of water. Such a dilution gives us about 4 pounds of sulphur to each 50 gallons of spray and is equivalent to the home-made solution diluted to the before mentioned summer strength. All of the commercial solutions, which we have used, gave fairly uniform results and compared favorably with the home-made solution. The chief difference between the home-made and commercial preparations seems to be in that while the former is much the cheaper, it is also the more troublesome.

Results of Experiments.

Experiments comparing the lime-sulphur preparations with Bordeaux mixture in the treatment of apple diseases have been conducted by the Bureau of Plant Industry in Virginia, Nebraska, Mis-

souri and Arkansas. Excepting bitter rot and blotch, all diseases of the fruit and foliage in all the experiments were as thoroughly controlled by the lime sulphur solution as by the Bordeaux mixture. The lime-sulphur produced very little or no russetting of the fruit and no serious foliage injury while the Bordeaux injured both fruit and foliage of Ben Davis, Jonathan, Yellow Newtown, and some other varieties. The lime-sulphur sprayed fruit was invariably superior in appearance to that sprayed with Bordeaux.

Experiments for the control of apple scab on Winesap were conducted in Virginia during 1909 with the following results. On the plots sprayed with lime-sulphur solution less than one per cent. of the fruit was affected with scab; on that sprayed with Bordeaux mixture about two per cent. of the fruit was affected; and on the check or unsprayed plot thirty per cent. of the fruit was scabby.

During the same year similar experiments were conducted in Michigan with like results. The scab was held down to four per cent. of the crop by the lime-sulphur solution and to three and one-half per cent. by Bordeaux mixture, while eighty per cent of the unsprayed fruit of the same variety (Wagener) was affected.

Results of experiments conducted in Arkansas by the Department of Agriculture were not favorable to the lime-sulphur solution in the control of bitter rot and apple blotch. These two diseases were checked by the spray but not thoroughly controlled. There is therefore some doubt as to the efficiency of the lime-sulphur solution as a remedy for bitter rot and blotch.

In both the Virginia and the Michigan experiments the commercial lime-sulphur solution at a strength of 2 to 50 slightly scorched the leaves particularly on the terminal shoots, but this did not prove to be serious and at the end of the season the foliage was in good condition, the apple leaf-spot having been controlled and the cedar rust held in check. It was found also that arsenate of lead used with the lime-sulphur solution did not result in injury to fruit or foliage and that it controlled codling moth as thoroughly as when combined with Bordeaux mixture. A full account of these experiments was published in Circular No. 54 of the Bureau of Plant Industry.

Experiments of 1910.

During the past season experiments were conducted at Waynesboro, Virginia, on Winesap, York Imperial and Ben Davis. From 75 to 200 trees of each variety were sprayed and a check of about ten trees of each variety was left unsprayed. Each variety was divided into four plots and treated as follows:

Plot 1.—Commercial lime-sulphur solution, $1\frac{1}{2}$ to 50 with 2 pounds arsenate of lead.

Plot 2.—Home-made lime-sulphur solution, 2 pounds of lime and 4 pounds of sulphur to 50 gallons of water, with 2 pounds arsenate of lead.

Plot 3.—Bordeaux mixture, 3 pounds bluestone and 4 pounds lime to 50 gallons water, with 2 pounds arsenate of lead.

Plot 4.—Check, not sprayed.

The Winesaps were sprayed, (1) after the cluster buds opened, just before they bloomed (April 5th); (2) as soon as the petals fell (April 19th); (3) three to four weeks later (May 17th); and (4) nine weeks after the petals fell (June 26th). The Ben Davis and York Imperial received only three treatments, the first application given the Winesaps having been omitted from these varieties, for the reason that in Virginia they do not suffer seriously from attacks of scab.

Lime-Sulphur Solution and Apple Scab.

In order to find the comparative efficiency of the sulphur and copper sprays for the control of apple scab, fruit from four Winesap trees in each plot and six check trees were sorted and the results are given in the following table:

TABLE I.

Lime-Sulphur Solution vs. Bordeaux for Apple Scab.

No. of Plot.	Spray Mixture Used.	Per Cent. of Scabby Fruit.
1.	Commercial lime-sulphur solution ($1\frac{1}{2}$ to 50) plus 2 pounds arsenate of lead.	2.2
2.	Home-boiled lime-sulphur solution (2-4-50) plus 2 pounds arsenate of lead.	6.1
3.	Bordeaux mixture (3-4-50) plus 2 pounds arsenate of lead.	6.2
4.	Check, not sprayed.	99.8

From this table it will be seen that the home-made lime-sulphur solution and the Bordeaux mixture both held the scab down to about six per cent of the crop, while practically all of the unsprayed fruit was scabby. The plot sprayed with the commercial solution had the lowest percentage of scabby fruit (2.2%) but this was probably due to a difference in the plots and not in the fungicides. Plot 1 contained medium-sized trees easily sprayed while the trees in plots 2 and 3 were large and rather difficult to spray with the outfit used.

It would appear from these results and those obtained in previous experiments that the efficiency of the lime-sulphur solution as a remedy for apple scab need be questioned no longer.

Effect on the Foliage.

Directly after the second spraying of the Ben Davis and Yorks, the foliage of these two varieties showed injury to a noticeable extent. This, however, was to be expected as the unusually cold and wet weather of April and May was particularly favorable to spray injury.

On the lime-sulphur plots the leaves of the young shoots were somewhat scorched about the margins, and as a consequence, some

of them were curled and distorted. Also on some leaves a few dead spots were to be seen and for a time it looked as though serious injury might ensue. The leaves, however, showed no further injury as the season advanced, even after the next application. By mid-summer practically all evidence of injury had disappeared and during the remainder of the season the foliage was in excellent condition. There was no apparent difference between the foliage of trees sprayed with the commercial solution and those sprayed with the home-boiled.

The foliage injury caused by Bordeaux mixture was markedly greater than that caused by the lime-sulphur preparations and differed in that it became worse as the season advanced. The leaves were more or less spotted with circular brown areas and a considerable percentage of them turned yellow and dropped.

The trees sprayed with the lime-sulphur solution went through the season with much better foliage than those sprayed with Bordeaux mixture, showing the marked superiority of the former fungicide as a foliage spray.



FIG. 2.—Unsprayed York Imperial tree almost defoliated by leaf-spot, located in same orchard and photographed at same time as that shown in Fig. 1.

The apple leaf-spot disease was controlled equally well by both fungicides, but the lime-sulphur solution showed some superiority over Bordeaux in its tendency toward the control of cedar rust, a disease which seems to yield more readily to the sulphur than to the copper sprays.

Effect on the Fruit.

There was no appreciable difference between the lime-sulphur solution and Bordeaux mixture in the control of the diseases that occurred on the fruit. Apple scab, fruit spot and sooty blotch were controlled equally well by both fungicides. But particularly in

the case of the Ben Davis there was a decided difference in the appearance of the fruit sprayed with these two fungicides. The fruit sprayed with Bordeaux was considerably russeted although very little of it was dwarfed or distorted as often occurs with Bordeaux sprayed fruit. The Winesaps were also russeted though not so much so as the Ben Davis, while the Yorks showed only a slight roughening of the skin. The latter variety is almost immune to Bordeaux russet.

In all the varieties sprayed with the lime-sulphur solution the fruit was almost entirely free from spray russet. The natural russet at the stem end was enlarged slightly and on some specimens this ran over on to the side of the apple, but apples which were at all badly russeted were extremely rare. As a rule the fruit was smooth clean and highly colored; placing it in a grade higher than that sprayed with Bordeaux mixture which would mean twenty-five cents to fifty cents a barrel in price.



FIG. 3.—Apples sprayed with commercial lime-sulphur—Scabby fruit on the right.

Adoption of Lime-Sulphur in Virginia.

As a result of the experiments conducted in Virginia during 1909 by the Bureau of Plant Industry, practically all of the Virginia apple orchards were sprayed with the lime-sulphur solution during the past season. We personally examined some of these orchards and have had reports from many of them. In every case, so far as we have been able to ascertain, the results were satisfactory, both as to the control of diseases and as to the effect of the spray on fruit and foliage. In the early part of the season there was a number of reports of injury to the young leaves, but in no case did this prove to be serious. In the Yellow Newtown orchards where bitter-rot is a serious factor, the lime-sulphur solution was used in the early treatments for scab and leaf-spot, and this was followed by applications of Bordeaux for bitter-rot. This plan was entirely successful, the russeting of the fruit having been avoided and the bitter rot disease controlled.

Conclusions and Recommendations.

The evidence obtained from various experiments conducted by the U. S. Department of Agriculture, and several of the experiment stations seems to warrant the following conclusions:

Bordeaux mixture often russets the fruit and injures the foliage of many varieties of apples and its use in the early part of the season should, therefore, be avoided as much as possible.

Lime-sulphur solution, diluted so as to contain four pounds of sulphur in each fifty gallons of spray, is a good substitute for Bordeaux mixture in the treatment of apple scab and some other diseases, and will not materially russet the fruit nor injure the foliage. The concentrated solution may be purchased from the factory and diluted at the rate of $1\frac{1}{2}$ gallons to 50 gallons of water, or it may be prepared at home.



FIG. 4.—Unsprayed apples—Scabby fruit on the right.

This fungicide will control apple scab, fruit spot, leaf-spot, and cedar rust, fully as well as Bordeaux mixture, but has not as yet proved to be as satisfactory for bitter rot. Where it is necessary to spray for this disease, the early lime-sulphur applications for scab may be followed at the proper time with Bordeaux for bitter rot, thus avoiding the russet and yet controlling the rot. There is also some doubt about the efficiency of lime-sulphur in controlling apple blotch and where this disease is bad Bordeaux should be used.

Arsenate of lead may be safely and successfully used in combination with the dilute lime-sulphur solution for the control of the codling moth and other insects.

The course of treatment best suited to orchards in Pennsylvania and adjacent districts may be outlined as follows:

Use the commercial lime-sulphur at a strength of $1\frac{1}{2}$ gallons to 50 gallons of water, or an equivalent strength of the home-made preparation, with the addition of 2 lbs of arsenate of lead in each 50 gallons of spray. Spray the varieties subject to apple scab: (1) as soon as the buds have opened, just before blooming; (2) as soon as the petals fall, beginning when they are two-thirds off; (3) three to four weeks later; and (4) nine to ten weeks after the petals have been shed. The first application of this outline may be omitted from varieties that are not subject to serious scab infections.

Where it is necessary to spray for bitter rot the first three applications of Bordeaux mixture at intervals of two weeks, beginning about June 25th to July 1st.

In mild cases of apple blotch the lime-sulphur treatment would probably be sufficient; but in severe cases two or three applications of Bordeaux will be required; the first to take the place of the third in the above outline and the others to follow at intervals of two weeks.

Self-Boiled Lime-Sulphur Mixtures for Peach Diseases.

Owing to the susceptibility of peach foliage to injury by applications outlined above should be followed by two or three applications of fungicides, the peach grower has been practically powerless to combat the diseases affecting the fruit and foliage. The use of Bordeaux mixture has been frequently attempted and in some cases, especially in dry seasons, the results have been satisfactory, but as a rule the injury produced by this and other copper fungicides is so great as to prohibit their use on the peach.

The efforts of the United States Department of Agriculture during the past few years, to develop and perfect a satisfactory fungicide for use on the peach during the growing season, have been crowned with unusual success. We have found that a preparation known as the self-boiled lime-sulphur mixture can be safely and successfully used on the peach for the control of brown rot and scab or black-spot. The mixture when properly applied, controls these diseases almost completely and does not injure the fruit or foliage.

The experiments have been conducted in Georgia, Virginia, West Virginia, Arkansas, Missouri and Illinois, and in every case the treatment was successful. During the past year many fruit growers in Georgia, West Virginia, and other sections, sprayed their orchards with the mixture, and so far no adverse reports of results have been received. So far as it has been tried the treatment appears to have been universally successful in controlling both peach scab and brown rot.

Arsenate of lead may be added to the mixture for the control of the curculio, which not only produces wormy fruit, but increases the brown rot infections by puncturing the skin and opening the way for the fungus. The insect occurs in destructive numbers in nearly all eastern peach orchards and in most cases where spraying with the self-boiled lime-sulphur for scab and brown rot is done, arsenate of lead should be added.

Preparation of the Mixture.

To prepare self-boiled lime-sulphur, use 8 pounds of fresh stone lime and 8 pounds of sulphur to each 50 gallons of water. In order to get good action from the lime the mixture should be prepared in rather large quantities, say enough for at least 200 gallons at a time, making the formula 32-32-200. Place the lime in a barrel or tub

and pour on enough water to almost cover it, then all the sulphur. Stir thoroughly while the lime is slaking and add more water if necessary to make a creamy paste. Slaking of the lime and the stirring will make a good mechanical mixture of the sulphur and the lime, only a small percentage of the former going into the solution. As soon as the lime is thoroughly slacked more water should be added to stop further chemical action, as there is some danger of dissolving enough sulphur to injure peach foliage. The mixture is then ready to be strained and diluted for spraying.

Outline of Treatment.

For the treatment of peach brown rot and scab, in Pennsylvania and adjacent territory, the following is recommended: Spray the early varieties, like Carman, Hiley, and Champion, about a month after the petals fall and a month or six weeks before the fruit ripens. Later varieties, as the Elberta, Smock, Salway, and Bilyou, will usually require three applications for the best results; the first to be made a month after the petals fall, the second, three to four weeks later, and the third, a month to six weeks before the fruit ripens.

For the curculio, arsenate of lead at the rate of 2 pounds to each 50 gallons of self-boiled lime-sulphur should be used in the first application but not in the others. Where this insect is a serious factor, an application of arsenate of lead, 2 pounds to 50 gallons of water, with 2 or 3 pounds of lime, to be made a few days after the petals fall, is recommended, but is probably not often necessary in this section.

A Member.—I would like to ask whether the commercial ground sulphur is as good as the flowers of sulphur?

Mr. Roberts.—It has given us just as good satisfaction.

A Member.—One word; what is the 2-4-50 formula?

Mr. Roberts.—Two of lime, 4 of sulphur, with a little water, boiled forty-five minutes, and then adding fifty gallons of water; if

A Member.—To what strength do you dilute the commercial lime-sulphur for peaches?

Mr. Roberts.—We used it 1-100; but got some injury, so that we do not recommend it.

Mr. Engle.—Would 1-150 prevent that and still do some good?

Mr. Roberts.—It is doubtful whether it would do any good. We have known it to burn at 1-200, and at that strength it is doubtful whether it would do any good in an orchard that is badly infected.

A Member.—Will the Japanese Plums stand the same strength that the peaches will?

Mr. Roberts.—I think so; the self-boiled lime-sulphur did not burn them.

A Member.—How long did you boil it?

Mr. Roberts.—As soon as you see red compounds begin to come to the top, you know it is time to stop. This takes about fifteen or twenty minutes.

A Member.—Have you been experimenting on the apple scab?

Mr. Roberts.—Well, we tried at one place with concentrated lime-sulphur 1-50, but the results were not such that we could be satisfied. The scab had not broken out sufficiently for us to be satisfied. We tried it in one orchard for foliage, and it controlled it very nicely.

A Member.—Have you made any effort to determine the origin of the peach yellows?

Mr. Roberts.—Well, one of the best men in the Department has been trying to do that, and if I could, my reputation would be made.

A Member.—Will there be any bulletins published showing the results of your 1910 experiments?

Mr. Roberts.—Yes, sir; very soon, and they may be secured by writing to the Department.

The President.—I see our Treasurer is now here, and we will have the Treasurer's report, if he is ready.

TREASURER'S REPORT FOR 1910.

Disbursements.

To Robert A. Smythe,	\$46 80
To Gabriel Heister,	14 56
To J. G. Leighton,	8 15
To G. Dow Dewitt,	2 50
To Sebring & Co.,	11 38
To J. S. Briggs,	11 75
To H. F. Hershey,	13 52
To L. W. Arny,	13 52
To H. F. Thompson,	44 44
To John D. Herr,	40 27
To R. L. Watts,	12 52
To Chester J. Tyson,	104 44
To M. B. Waite,	20 75
To John F. Boyer,	10 11
To H. P. Gould,	17 65

To Lewis F. Walton,	3 10
To Frances N. Thorpe,	15 00
To Whitehead & Hoag Co.,	14 00
To J. P. Stewart,	10 63
To C. E. Myers,	5 28
To W. F. McSparran,	19 67
To B. J. Case,	16 89
To Publishing House of the United Evangelical Church,	37 58
To Mrs. D. M. Stewart,	75 00
To Gatchel & Manning,	9 00
To Edwin W. Thomas,	14 22
To The Sackett & Wilhelms Co.,	25 00
To Publishing House of the United Evangelical Church, ..	197 29
To Chester J. Tyson,	60 12
To balance, Cash on hand,	564 62
Total,	\$1,439 76

Receipts.

Cash balance, January 11, 1910,	\$74 51
Annual dues for 1910, collected at Tunkhannock,	29 00
Received January 15, 1910, State Appropriation,	500 00
Received from C. J. Tyson, annual dues collected during 1910, ..	260 00
Received from C. J. Tyson, for S. Morris Jones, life member, ..	10 00
Received from C. J. Tyson, for Miss E. M. Sharp, life member, ..	10 00
Received from C. J. Tyson, for Geo. M. Wertz, life member, ..	10 00
Received from C. J. Tyson, for Sam'l C. Moon, life member, ..	10 00
Received from C. J. Tyson, for Robt. M. Eldon, life member, ..	10 00
Received from C. J. Tyson, for Thos. W. Barlow, life member, ..	10 00
Received from C. J. Tyson, balance from Phila. Exhibit, ..	9 25
Received December 23, 1910, State Appropriation,	560 00
Received annual dues for 1911 in advance,	7 00
Total,	\$1,439 76

Harrisburg, Pa. January 25, 1911.

We, the undersigned, have examined the above Treasurer's account and find the same to be correct.

JOHN F. BOYER,
C. O. FINN,
T. C. FOSTER,
Auditors.

On motion this report was accepted as read.

PLUMS.

By J. W. KERR, Denton, Maryland.

First: Can plums be grown in a commercial way in this state, with reasonable assurance of fair profit?

Second: If so, what as to adaptability of soils?

Third: Are there any special cultural operations, indispensable to the realization of the golden hopes of the planter?

Fourth: How decrease the errors, common in the selection of varieties?

Suppose a plat anywhere east of the Mississippi river, one hundred miles square, had a plum specialist at each single angle to solve these queries by the requirements of modern orchard management; as far as general principles would aid the answers would be branded with a similarity, suspicious because of the monotony. If the square is reduced to one-hundredth of this size, with an enthusiastic orchardist at each corner a comparison as to *details* would disclose a variety, rivaling that in the recorded and publicly expressed opinions of the Ben Davis apple.

The accomplishing of the absorbing and vital end, compels the utilization of means, unlike in kind and character, in the prompt control of emergencies, quite frequently and unexpectedly thrust upon the person in charge. No doubtful logic—no inconsistent hypotheses—no fragile assumption need be employed in making affirmative answer to query, No. 1. A far better, stronger and clearer proof than is possible by such means is the tangible fact that in every county in this great commonwealth, plums are grown in a limited way, and in some instances by primitive means, for family use; this is common knowledge, and practically indicative as to the possibilities possessed by this fruit for market growing, as also reliably exemplifying the esteem in which it is held by the people.

The greatest plum puzzle I have seen, hails from a county in this state, where only slight and crude attention is given the plum, outside of what is necessary to provide sufficient fruit for family use; yet from this wholly unexpected source, where for years it has been the main dependence for such purpose, we have a variety, upon the botanical status of which the best authorities do not agree. Up to the present it remains a what-is-it, as relates to species. This digression is made simply to emphasize the important truth, that when plums are discussed from the stand point of a prescribed area, the merits of the fruit as a whole are generally underestimated. Now, if here and there on the farms and about the homes of the people in the different counties, this fruit grows well enough to afford a supply to such families, where in most instances the only attention given the trees is to gather the fruit from them, at all other seasons treated with cruel unconcern and superlative neglect; by what mental process will any other rational conclusion appear in the lime light of common sense, other than that for market purposes, the plum can be successfully grown in almost every county in this state, regardless of the variability of concomitant circumstances, as relates to soil and atmosphere? Comparatively, plums are little if any more perishable as a market commodity than peaches, though the general family consumption is more restricted, which is but a natural result of circumstances. That all of our smaller cities and larger towns offer profitable markets for much larger quantities of the fruit, than are now supplied, is neither fanaticism or sophistry, but an every day fact. Referring to the second query, soils as relates to their adaptation for especially desired purposes, are largely controllable by and amendable to intelligent ambition and the demands of necessity; for in many instances fine fruits are pro-

duced now, on soils which but a score of years back, a seriously expressed intention of their utilization for such purposes would have been ruled out by the admonition of prudence and the promptings of sound judgment; because of the apparent violation of the accepted teachings of nature. Nature itself, however, is not infallible. It is none the less a fact, that the nauseating stench of the sweat-shops stamps its deathly pallor on their inmates with no more certainty, than do the untreated and neglected conditions of unsuitable soils on tree and plant life. The exercising of good horse sense would promptly find a remedy in either case, the best soils in an agricultural sense are largely artificial, the degree of fertility and adaptiveness to profitable production in special lines, simply portrays in a broad sense, the intelligence and business qualities of the owner. Not every one distinguished by the honorable title of farmer, is an expert in soil renovation and improvement; neither is every one who plants an orchard expert in soil analysis. The common school of nature does in such cases accurately and distinctly blaze the trail for willing eyes to follow to needed improvement. Generous addition and discreet subtraction will with mathematical precision provide a balanced ration for the soil, and thus assure to it, both ability and inclination for liberal and kindly response to the wishes of its quarter master, who happily treading in wisdom's ways, has learned that tillage is more closely akin to irrigation than to manure, and that effective drainage is a "plumb" necessity.

Query number three if technically construed might imply that some special or unusual process, different in mode and measure from culture given to other fruits is essential with the plum, but the experience everywhere of successful growers thoroughly establishes the opposite; the practical sanity of profitable plum growing, while tolerant and forbearing, discloses a somewhat unyielding conviction, favorable to frequent surface stirring with such implements as are adapted to the character of the land. That is to say, often enough to protect it against waste either by useless weed growth or in moisture. The means employed to prevent the one, promotes the other. Present day fruit growing operations of the commercial class are notable for deeply interested vigilance and searching economy. Not the kind of economy that restricts needed cultural expenditure, and loses ten fold in the quality and quantity of the orchard products; the Book of Books warns against this type of economy in the parable of the talents. True economy in commercial fruit growing of any kind implies general investment for the needs of the trees, as discerned by kindly watchfulness, confirmed by good judgment and rendered effective by methodical application. No arbitrary code controls, nor ironclad rule regulates in the essential activities of brain and brawn, to forestall unfavorable weather influence; the intuition growing out of personal interest and experience is the surest reliance.

The fourth inquiry invites consideration of features, viewed collectively, are conspicuous in their instability; because of potent local influences, more especially climate and market. Atmospheric extremes as relates to temperature are more pronounced as

you recede from large bodies of water; inland situations while shorn of such ameliorating and softening influences in temperature, on the other hand, by the same conditions are to a larger extent free from excessive humidity—the foster mother of brown rot in the plum. The selection of varieties for a commercial orchard, is much like reading a sign-board that reads differently from different angles. Subsequent to the determination of a selection meeting the climate requirements, is the choosing from such selection, a list strictly in keeping with the demands of the market for which the fruit is intended. The fundamental or primary work in establishing an orchard is not a whit less important than in other business enterprises, and is more safely executed under the directions of the trinity of when, why and what, than that of heard, haste and hope. However profound the pomological knowledge of the planter—practical and thorough may be his judgment as to soil—suitableness of varieties as to climate and peculiarities of market, it very rarely occurs that a majority of the varieties found in his first orchard will be found in the second; actual test exposes in the most impressive manner a weakness or short coming in some particular that he fails to remedy. Experience of this kind in one or two instances does not conclusively establish that varieties thus condemned and barred by one planter, are unprofitable under the management of others.

Epitomised—the entire question as relates to profit, soil, culture, market, and varieties is largely under the effective control of one lever, the man.

In a review of the several species, or groups of plums as our authorities have classified them, for the purpose of selecting varieties most promising for a commercial orchard, it is wholly useless to include the Nigra group. Not because of any question as to hardness of trees in withstanding low temperatures, but the thick, leathery skin of the fruit makes it undesirable in our markets. The same situation exists, to a great extent with the Americana group, though it contains a long list of varieties. For the west and north-west this group affords much greater assurance of crop production than any other, but with the exception of a very few varieties the fruit is met acceptable with Eastern consumers.

One of the most notable exceptions to this thick skinned feature is found in the variety named Hanson, which is the earliest in season of the kinds constituting this large group. The Stoddard is another variety which shows less of the politician in its skin than the average, and possesses that captivating merit of large size. There are quite a good many other kinds belonging to this group, that produce fruit of a large size, but in markets where buyers can choose, the plums with thinner skins are preferred.

The Miner group is somewhat of a pleasing modification of the Americanas as pertains to the skin, but is deficient to the same degree in the color of the fruit; and on this account is rather unattractive in the package. None of the varieties of this group are early in season. The "Domestica" group which embraces about all the old time garden plums including the Damson, Prune and Gage, shows in

its better varieties that much greater effort has been given to its improvement, than is evidenced by any of the native groups. It is still regrettably patent that to make a selection of the Domesticas, for commercial orchard purposes, would be a very uncertain and lottery like transaction; though in several counties in this state, splendid fruit is occasionally produced from such varieties as Lincoln, Pond, etc. The Richland—a Berks County production, while not so large has vigor and productiveness of tree that gives it favor in some localities. Lombard is perhaps planted over a wider area than any other variety of this time honored group; it seems to adapt itself to varied localities more satisfactorily than most of the Domesticas. In quality it is quite variable—poor at all times, but worse some seasons than others. Generally this group offers no specially inviting promises to him who would grow plums for market. The care and skill necessary to grow the finer kinds make them too expensive to favorably compete with the attractive products of the Pacific coast. The many varieties of this group that were imported from Russia some years back, signally failed to fulfill the high hopes that many plum specialists entertained for them. They are rarely catalogued now by tree propagators.

The Triflora or Japanese group has assisted very materially in creating a more general interest in this beautiful and wholesome fruit. Fortunately the earliest importations of these contained one of the best varieties of the species—the Abundance. This variety deservedly holds first place in public esteem. Good color, size and quality, with a free growing, healthy handsome and productive tree; it is well equipped for the market orchard. The Chabot ripening two or three weeks later is another variety that has won favor with growers; while the fruit of this is in all respects equal to the Burbank, there is no comparison in the trees; the Chabot with its fine, vigorous upright habit in growth, while the limit is overleaped in slovenly, dowdy habit by the Burbank. The Red June another pure Japanese variety proves profitable for markets not too exacting as to quality; its early season and brilliant color usually secure profitable sale for it; the tree is a good grower, of good form, but comparatively short-lived. These constitute the cream of this group and are about all that are worthy of much thought as commercial kinds.

Amongst the "Hybrids" there are a few profitable market sorts; the most promising one is the Sixweeks, a Texas product and clearly the earliest in season of any plum, worthy of attention by market growers. A rapid growing tree, forming a rather close head, that is regular in contour; an abundant bearer of bright colored fruit of full medium size; rather deficient in quality, but attractive to buyers, owing to its very early season and bright red coloring.

America is the only one of the many kinds from the Pacific coast that is sufficiently resistant to brown rot, to hold out a reasonable hope of fair profit as a market plum.

Gonzales, from Texas is superb in size and appearance, good enough in quality but not sufficiently resistant to *Monilia* or brown rot to warrant unqualified endorsement.

The Wayland group embraces some varieties that should be profitable to grow in most, if not *all* the counties of this state; the good citizens of which are generally graduates in gastronomy, and never dishonor their diplomas. Your tradition not only perpetuates, but promotes a liberal domestic provision of sweetmeats and table condiments, and this group of plums is unequalled in possibilities in that relation.

For preserving it is unexcelled; and for fruit butter (under the dexterous manipulation of the tactful kitchen queen) it affords a relish, unapproached in its appetizing fascination; for spicing these plums are in every particular, the peer of the best Damson. The trees, too, are not only pleasing to the eye, but distinctly and reliably productive. The Benson is a Nebraska variety, with fruit as large as any of the group, bright cherry red, handsome, and a little earlier in season than the other choice varieties of the group. Tree a very rapid grower with fine healthy foliage. Reed, a trifle later in ripening, but otherwise similar to Benson. The tree of this variety is notably pretty, clothed in showy, large, healthy, foliage; robust and stocky in growth. Wayland, still later in season and every way fine. While there are other good varieties in this group, this trio may safely be classed as the select. This class of plums are free from leaf-blight and black-knot—almost immune to injury by the curculio and brown rot and when well ripened are very acceptable for eating out of hand. Why not grow them for the markets?

The Wildgoose group has in many localities established its value for commercial planters, and at this day requires no certification of merit in its discussion, farther than an expression of preference as to varieties. Briefly stated—the Milton for early, followed by Wildgoose and Whitaker and finished up with the Mrs. Cleveland, give the planter the most profitable varieties of the group, for a commercial orchard, all of these kinds are very productive when properly pollinated.

It is a generally known fact that the kinds named in this group, whether planted separately or together will prove unsatisfactory in bearing. Yet the Simley, classed in this group—interspersed in such planting supplies at the right period effective pollen.

The Chicasaw group offers nothing to large, or market growers that would warrant their use in anyway, except as pollinators. For nearby or local markets, the Munson possesses merit; more on account of its size and early season than its quality. It is too soft for distant market. Newman is quite a productive variety and some seasons attains size large enough, but it keeps the grower guessing as to when he will finish picking them, as its fruit ripens over a long period. These two varieties are both, thoroughly reliable as effective pollinators for the Wildgoose type.

The several other species or groups contain nothing claiming attention in this paper. In conclusion, the likes, dislikes and predilection of the planter, will in a large measure determine the group best suited for him; and after settling upon such choice, varieties to fit the market he aims to supply, can be chosen with a minimum of uncertainty.

A Member.—May I ask Mr. Kerr whether it is any trouble to get the people to take the Benson in place of the old Damson?

Mr. Kerr.—Well, it is like pulling teeth to make any intelligent housewife believe there is anything equal to the old Damson. It has been hammered into them with far greater force than Sabbath School teaching. It was quite a while before I could get my wife to believe it, but finally she became convinced. Once you succeed in getting people to try them there is no difficulty; one trial is sufficient. You plant one of these trees, and in ten years see the difference between it and the Damson. It is superior in foliage, in bloom and in fruit.

Prof. Surface.—What is the color of the fruit?

Mr. Kerr.—Red. The color is the same in all these varieties.

Prof. Surface.—What do you know about the Satsuma?

Mr. Kerr.—If I were to tell you what I really think of it, it would not sound very well. I planted three hundred of them, and they are an absolute fraud and failure in my climate, but I find some places down here and in the Northeast, where it is splendid.

A Member.—If you could raise the Japanese varieties successfully, would you raise any of the Wild Goose group?

Mr. Kerr.—Well, if I was raising them for money, I don't think I would raise any Japanese. In 1898—it sounds fishy, but it is absolutely true, although dangerous to talk about in public—I netted over \$2,800 on three acres, a trifle over \$900 an acre. I think you will agree that was doing fairly well.

Prof. Surface.—What about the German Prune?

Mr. Kerr.—No good with us; nothing in the Domestica group does well with us.

A Member.—In connection with the Japanese, will the Wild Goose bring as good a price?

Mr. Kerr.—More per acre; not as much per tree.

A Member.—The gentleman spoke of the tree pollenizing itself. I want to ask him what he thinks of a tree standing half a mile away from any other plum tree, as to whether it is necessary to have a plum tree, or plum trees of two or three varieties in order to have it pollenized? If this is the case why does a tree such as I have described, pollenize itself?

Mr. Kerr.—It takes a good deal of time to answer that. You take, for instance, the Keifer Pear; ordinarily it is very fertile, but

there are cases where the trees standing in the middle of the plot were less fertile than those that received their pollen from other sources. This is a large subject, and the most complete information that you could get is contained in a bulletin issued by the Department of Agriculture at Washington.

The Secretary read a letter from Prof. Symons of the Maryland Agricultural College relative to the "Simmons Bill" which provides for the quarantine and inspection of all imported plants and nursery stock.

The President.—This communication brings up a very important matter and I shall refer it to the Committee on Resolutions.

On the 21st of December last, there was formed at Washington, D. C., an association called "The Eastern Fruit Growers' Association," and we were asked to join it. It is intended to take in every state and county organization from Maine to Florida. Its object is chiefly to watch legislation at Washington, and help or hinder such legislation as may affect the fruit grower. I think the annual dues are five dollars for the Association and one dollar for an individual wishing to join. It is a proper move and I hope our people will take it up.

THURSDAY, JANUARY 26, 7.30 P. M.

President Hiester in the Chair.

The President.—The meeting will please come to order. The first thing on the program is the report of the Committee on Resolutions.

REPORT OF THE COMMITTEE ON RESOLUTIONS.

Your Committee on Resolutions begs to report as follows:

WHEREAS, We, the members of the State Horticultural Association assembled, believing that this has been one of the best meetings in the history of the organization, desire to express our appreciation to all who have in any way contributed to its success; therefore be it

Resolved, That we do hereby tender special thanks to the Committee of Arrangements and to the Chairman and members of the Exhibit Committee for their untiring efforts; to the representatives of the press, who have reported our proceedings; to the visiting speakers from a distance, who have rendered so much valuable service in the line of instruction, and especially to the Hon. G. B. Brackett, of the Department of Agriculture, Washington, D. C., for his highly satisfactory work in judging the fruit exhibit.

WHEREAS, The orchard experiments, as conducted by Prof. J. P. Stewart, of the Pennsylvania State College, promise results of very great value to the fruit growers of this state, be it

Resolved, That this Association express its appreciation of these investigations and urge their continuance as long as may be necessary to arrive at definite and positive conclusions.

WHEREAS, In view of the increasing interest in all horticultural lines and from our knowledge that the School of Horticulture at State College is laboring under great difficulties, for lack of room.

Resolved, That we urge upon our legislature the necessity of providing sufficient funds for the erection of a Horticultural Hall commensurate with the great industry in the State.

WHEREAS, We have been apprised of the fact that there are serious diseases of the honey bee, and that they are destroying this most useful insect to an alarming extent, in many counties of Pennsylvania, and

WHEREAS, This causes a serious loss in that industry known as "Bee-keeping," and also to fruit growing through a reduction in the number of bees needed to fertilize blossoms, therefore be it

Resolved, That we commend our Economic Zoologist, Prof. H. A. Surface, for his excellent work along this line and urge that our Legislature provide sufficient funds for continued investigations on this subject.

WHEREAS, Believing that a parcels post would serve a large public interest, through the development of its possibilities along the line of bringing the producers and consumers into closer relations, this Association declares itself as favoring the speedy enactment of such a law: therefore be it

Resolved, That the Association urge its members to continue in their efforts to secure its enactment.

Resolved, That we heartily endorse the "Good Roads" movement and do all in our power toward improving road conditions in Pennsylvania.

Resolved, That we heartily commend our Governor, the Hon. J. K. Tener, for the interest taken in our work, and the willingness on his part to use his influence and office for the betterment of our conditions.

WHEREAS, This Association has profited greatly by the special appropriation of \$1,000 for two years, secured from the State through the efforts of our worthy Secretary of Agriculture, Hon. N. B. Critchfield, be it

Resolved, That we express our appreciation of this financial support, and request that at least a thousand dollars per annum be appropriated to the Association for the extension of the work.

Resolved, That we heartily endorse the bill now before Congress known as the "Simmons Bill," which provides for a national inspection of all imported trees and plants.

Resolved, That we highly commend and endorse the movement recently inaugurated in Washington, D. C., and known as "The Eastern Fruit Growers' Association."

WHEREAS, Believing a State Fair would be especially of great advantage in advancing the horticultural interests of the State, in bringing about each year a state exhibition of fruit, vegetables, flowers and plants, be it

Resolved, That we hereby express ourselves heartily in favor of the project.

Resolved, That we appreciate the importance, and heartily endorse the work accomplished by Prof. H. J. Wilder, of the Department of Soils, in connection with our State Experiment Station, and we respectfully request that our State Experiment Station use such influence as they deem proper to have Prof. Wilder continue the work for the ensuing year.

WHEREAS, Providence in His almighty wisdom, has removed from our ranks one of our honored members, an ex-Treasurer of this Association, Mr. J. Hibbard Bartram, of Chester County; also Mr. Samuel C. Moon, a life member from Bucks County, a well-known nurseryman and landscape gardener, also an ex-Treasurer, be it

Resolved, That this Association express its deep sense of loss and extend to the bereaved families, its sympathy.

(Signed)

F. H. FASSETT,
JOSIAH W. PRICKETT,
U. W. HARSHMAN,
ABRAM HOSTETLER,
S. L. BRINTON.

On motion this report was accepted.

Mr. D. S. Kloss.—There has been a wide work done in this State which I would like to recognize. I have therefore prepared this resolution:

Resolved, That we hereby endorse the excellent work of the Division of Zoology of the Department of Agriculture, in arousing an interest throughout Pennsylvania in the saving of the orchards of the State, the extensive planting of new orchards, and the production of perfect fruit, which work has been especially advanced by means of what has become known as "The Model Orchard Plan," as devised by Prof. H. A. Surface, State Zoologist, and ably carried out by his force of horticultural inspectors.

Resolved, That we hope that State Zoologist Surface will be given every encouragement in the continuance of the work by the members of this Association, and we wish him and his inspectors God-speed in their efforts to maintain Pennsylvania in its position as one of the foremost fruit-growing states of the Union.

Mr. W. E. Grove.—I move an amendment to this resolution: That we include the work done by the Department of Agriculture, under Secretary Critchfield, and co-workers; by the Pennsylvania State College and Experiment Station under President Sparks, Dean Hunt, Professors Watts, Agee, Wilder, Stewart, Wright, Gregg, Armsby, and co-workers and all other work being done in Pennsylvania in the interest of agriculture and horticulture.

On motion this resolution and amendment were duly carried in the regular way.

Mr. Fox.—These resolutions have been adopted, but there has been very little said about the death of two of our members, Mr. Bartram and Mr. Moon.

The President.—I will take the liberty of asking Mr. Fox to prepare a memorial of the death of these gentlemen. He is familiar with the circumstances.

Mr. Fox.—As a former secretary and one of the oldest members of the Association, and well acquainted with these two gentlemen, I shall be pleased to do so.

IN MEMORIAM.

By CYRUS T. FOX, *Reading, Pa.*

I would regret very much to have this part of the proceedings pass by without a further reference to the two deceased members of this Association, whose names have been mentioned in the report of the Committee on Resolutions. Each served as Treasurer of this Association, and rendered valuable services.

J. Hibbard Bartram.

J. Hibbard Bartram served longest in that office, and during his connection of many years with the Association was very faithful in his attendance. He was a zealous and successful fruit grower, and did much to advance the interests of horticulture in his part of the State. A native of Chester County, and a member of the Society of Friends, he came of distinguished horticultural stock. He was a lineal descendant of that John Bartram who was one of the earliest botanists of this country; after whom Bartram's Garden in Philadelphia, a wonderful collection of the trees and flora of America, located on the Schuylkill river in the southern section

of that great city, is named. The death of J. Hibbard Bartram occurred about the first of April of last year. He attended an Orchard Meeting shortly before, at which your speaker was present, and he then appeared to be in good health. He was a man greatly esteemed by his neighbors for his uprightness of character. He is survived by a widow, one son and one daughter. He was about 75 years of age.

Samuel C. Moon.

Samuel C. Moon was one of the most prominent nurserymen of this country, and was President of the Pennsylvania Nurserymen's Association for two years. He was a son of Mahlon Moon, the pioneer nurseryman of Bucks County, and was born on the old Moon homestead where he passed away. The nursery conducted by Mr. Moon has been in operation since 1848, and contains many rare plants and shrubs, including what is said to be the largest purple beech in the United States. He was likewise a naturalist of renown, having been one of the foremost members of the Delaware Valley Naturalists' Union.

As an illustration of his strict business ideas, it is related of him that, upon one occasion, George J. Gould, the railway and telegraph magnate and multi-millionaire, called at Mr. Moon's nursery one Sunday, and was given permission to inspect the grounds. Mr. Gould became enthusiastic over the magnificent specimens of shrubbery on the place, and expressed a desire to have duplicates of many of the choicest things he saw. He was ready to give an order, which in the aggregate would have run into thousands of dollars, but Mr. Moon declined considering it, "because it was the Lord's Day." A number of months elapsed before the order was renewed.

Mr. Moon was a member of the Orthodox branch of the Society of Friends, and for twenty years had been a member of the Board of Managers of the Westtown School, near West Chester, a Friends' institution. His death occurred after several days' illness on January 21, just a few days before the present annual meeting of this Association. Surviving him are his widow and one daughter, besides two brothers, William H. Moon (a former President of this Association) and James M. Moon.

PENNSYLVANIA APPLE SOILS.

By PROF. H. J. WILDER, *Bureau of Soils, Washington, D. C.*

Mr. Chairman, Ladies and Gentlemen: There are many localities in the State of Pennsylvania that are well adapted to apple growing, and it is to the leading growers of such localities that the State owes the existence of this organization. Now, those sections of the State already developed are fairly well known, and it is my purpose at this time to invite your attention to such portions as have not been so well developed. I will say right here, however,

that we would not have to go very many miles from where we are now to find plenty of undeveloped fruit soil as good as any already planted, that may still be had at very reasonable prices.

Nine years ago your President prepared a bulletin for the State Department of Agriculture on "Varieties of Fruits That May be Successfully Grown in the State of Pennsylvania," and I may take occasion at this time to call your attention to the particular excellence of that work in serving the horticultural interests of Pennsylvania.

I will ask you to start with me on an imaginary trip from here to Northeastern Pennsylvania. The map on the wall has been prepared to show some of the principal soil boundaries. The yellow color represents the South Mountain range. The Blue Mountain, or North Mountain, is here shown by the blue belt extending from near Belvidere on the Delaware River southwest to the Maryland line.



A ROW IN MR. H. C. SNAVELY'S ORCHARD, LEBANON COUNTY,
ON HAGERSTOWN CLAY LOAM.

South Mountain and its adjacent slopes are well adapted to fruit growing, as most of you know. Pennsylvania owes, in fact, a great deal of her fruit growing reputation to that region, and I may add that it is truly astonishing that the prices of good fruit lands in this state are so low as they are, even in the South Mountain region.

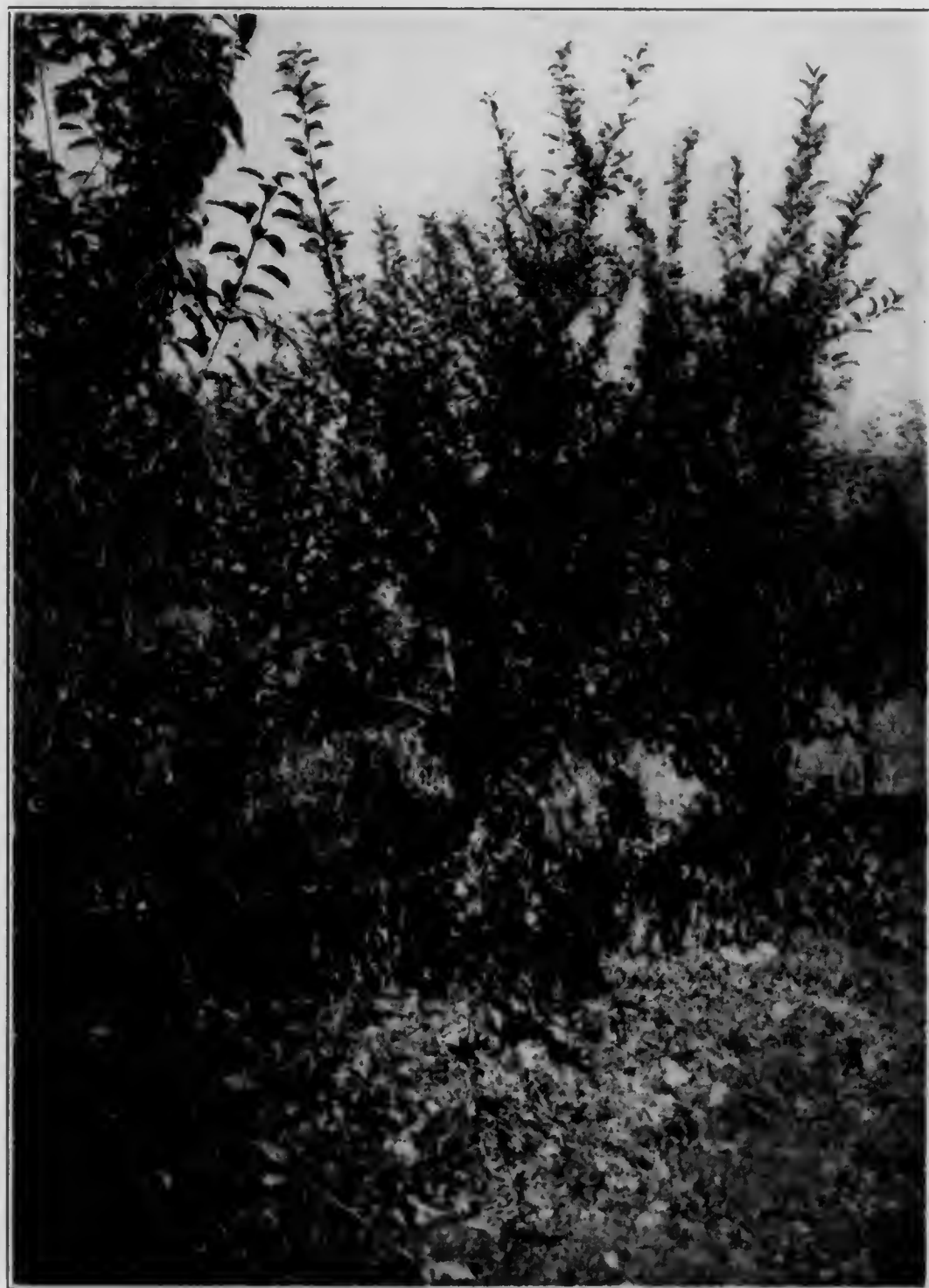
Just east of the Allegheny Mountain, or the Allegheny Front as it is often called, is outlined the "Appalachian Mountains and Valleys Region" which extends in cross-section southeastward from the Allegheny Front to Blue Mountains, and lengthwise from the Delaware River southwest to the state of Maryland. Its width in Maryland is practically the distance between Cumberland and Hagerstown, the latter town being in the limestone valley just to the

east. Along the Delaware River the same broad belt extends from near the Water Gap to the northeast corner of the State. This section is a part of the great Appalachian Mountain System which becomes much higher in elevation in the Southern states. The region consists of a series of elevations and narrow valleys just like this (holding up fingers). Now, the slopes of these hills are adapted, in some cases, to profitable orchard planting, though on the other hand, many of these hills are not very productive. There are three distinct classes of soils to be found there: First are those soils derived from yellow and brown shales and sandstones which are called the Dekalb soils; second the Upshur soils which come from red shales and thin-bedded sandstones of the same color; and lastly the Hagerstown, or limestone, soils which occur in some of the valleys. In this section of the State there are many suitable locations for orchard planting, but they should be selected with care as to the character of the soil, and to the air and water drainage. The prices for land are so exceedingly moderate that it seems unnecessary for any Pennsylvanian to go out of his own State to grow fruit. The old Juniata peach belt, once famed for its excellent product, is in this region, and although it suffered severely from the ravages of disease it still possesses some good orchards, and is certain to see many apple orchards planted, and at least some peaches, notwithstanding the yellows. Why was this famous peach belt first developed? Simply because some fellow living there once made up his mind to grow fruit, and his efforts were rewarded with some degree of success. It is only human to think that whatever my neighbor does I too can do, and the result in that locality was that most everybody tried the peach business and it was this fact that led in some measure at least to the great number of failures. The striking illustration which the old Juniata peach belt affords is its contrast to other districts not far from it that are just as well adapted to peach orcharding, yet have never been developed. Land prices are still very low in this whole region.

Going northeastward to the region around Wilkes-Barre similar topographic conditions are found. I spoke a moment ago of the series of ridges crossing the State from the northeast to southwest. This green line (pointing) was put there to indicate the southern extension of the glacier which is supposed to have come down from the North spreading over the hills and valleys to this line. The soil and rock debris left by the glacier gives rise to the Volusia series of soils. Where the layer is so very thin that it has been of less influence in forming the present soils than the original materials over which it passed, the soils have been separated and mapped as the Warren series; and again, where underlying red shale was ground up so fine by glacial action, or where the glacier left an overdeposit of red soils deep enough to determine the character of the surface materials, the Lackawanna soil series was mapped, being named for Lackawanna County where it was first found.

In northwest Pennsylvania other areas of the Warren soils occur in Crawford and Warren counties, in fact the series name was taken from that of the latter county. Northeastern Pennsyl-

vania, it seems to me, possesses wonderfully good opportunities for orcharding at the present time. I was deeply interested in finding how cheap good orchard land can be purchased in that section of the state. Thirty, forty, fifty dollars an acre, and sometimes even less than that, will buy excellent orchard land in that region within



NINE-YEAR-OLD WAGENER ON LACKAWANNA SILT LOAM.

a few miles—frequently not more than ten, and very often not more than five—of the Wyoming Valley markets, which are among the best in the United States. You all know that the coal town markets, whether located in the anthracite or the soft coal regions, are wonderfully good. And even if the commercial orchards should be developed to such extent that these local markets could not take all their products, they are within a short distance from New York and other eastern cities with an aggregate population of many mil-

lions of people. This is where the winter varieties can be grown to marked advantage. The Northern Spy, Bellfleur, Baldwin, Stark, Rhode Island Greening and many other excellent varieties can be grown profitably in this region. I will not take the time to enumerate many varieties, but the Northern Spy interplanted with Wagener, which also does remarkably well there makes a very effective combination. There are men from that section attending the meetings here this week who own orchards that the Wagener has paid for by the time the Northern Spy came into bearing. One other advantage that district has in growing the Northern Spy is that it comes into bearing sooner after planting than in most sections of New York, in fact it will average to bear in the Wyoming Valley region three years earlier than in Connecticut or New York. Now, this is a remarkable advantage which the state possesses, and there is perhaps no apple of finer quality than Northern Spy when well grown. Besides the Wagener there are other early bearing sorts that have given excellent results as fillers, especially the Wealthy and Oldenburg.

I want to say just here—though it is somewhat of a break in the subject—that at the Lancaster meeting a few years ago I said that the Baldwin and Spy would not do their best on the same kind of soil, that a light soil brought the best results with the former variety and that a soil somewhat heavier was preferable for the Spy. Some one attending got the idea from what I said that neither of these varieties could be grown with any degree of success on any other kind of soil than the ideal described. Now, I hope I did not present the subject in quite so obscure a manner as that, in fact I am sure the records do not so state, but if anyone else did get that idea from anything I said I want to correct it. My idea is that within a given set of climatic conditions there is an ideal in soils for certain varieties and that in orchard planting we should aim to select those soils that come nearest the ideal conditions for the different varieties. If the best possible soil for each variety is not available the trees should be planted on the soil that comes nearest the ideal, and one should always work with that end in view.

In the central northern part of the State (indicating on the map the following counties: Warren, Forest, McKean, Elk, Cameron, Venango, and northern Clearfield, Jefferson and Clarion) the conditions are quite different. The altitude is high—say 1600 to 2200 feet, or possibly 2500 feet—and the soils are quite different. The region has not been glaciated at all, and the sandy types of mountain soils predominate. The district is not generally so well adapted to orcharding as some others, though good soil locations may readily be found. There is a good deal of waste land, but the prices are such that one can afford to have some waste land—from \$3.00 an acre up. Well improved land including buildings may be had at \$30 to \$40 an acre.

In the southwestern part of the State we have three series of industry has been developed, and here in Mercer, Lawrence, Crawford and southern Erie counties the glacier has passed, forming another important area of Volusia soils where orchards can be grown

successfully. Land prices are slightly higher than in the last district described but still they are only forty to fifty dollars an acre, with sixty dollars for very good improved land with good buildings. Just to the south are excellent markets, although not so remarkable as the coal markets of the northeastern part of the State. In many localities within this region there are splendid opportunities to grow special crops. One of the cases I have in mind is that of a young man from one of these towns who came to me up at State College the other day and said he wanted to grow fruit. His father is a fruit dealer but he said, "I don't believe I am worth as much to the business in town as I am on a farm not far distant which my father owns, and I would rather develop the farm. Similar cases are not infrequent at the present time. Near Pittsburg special crops can be grown to advantage for that market.

In the southwestern part of the State we have three series of soils: The DeKalk previously mentioned; the Brooke series, derived from limestones but still very different from the Hagerstown soils that come from the limestone of southeast and central Pennsylvania; and the Westmoreland soils which come from a mixture of shale and limestone, making very good soils. If it were not for the injury from coke smoke these should be very productive soils.

Now, I have gone over this map upon which are indicated only the broad divisions of soils very hurriedly and will not take any more time in a general description of soil conditions unless there are some questions. Considering the present prices of land and soil conditions, there are three forms of orcharding that may well be developed with profit. First, the commercial orchard—and there are two ways to work along this line,—one, by the extensive method, and the other by the intensive. The goal of the first is to produce a large number of carloads, but with the other the quality of the fruit is the first desideratum, the quantity the second. The first means more acres, the other more salable fruit per acre. I believe the most profitable type of commercial development is a combination of these two forms. One may hardly plant too large an acreage until the point is reached where excellent care is sacrificed in some measure, owing to the large extent of the orchards. This will vary much with circumstances, but I believe it is very easy for a man to plant so large an acreage that he is compelled to neglect some of the finer points of the business, even from the strictly commercial viewpoint; and there is a question as to where this point comes—where the individual acreage should stop. In planting, the character of the market must be taken into consideration, and those who adopt Mr. Farnsworth's idea of growing for a special market must include varieties that ripen during a long season, from early to late. This particular method of intensive growing is coming to have more and more influence on orchard development.

Then there is the farm orchard. I am enthusiastic enough about the commercial orchard but we must not forget the farm orchard which, in fact, is responsible for the high rank Pennsylvania has held in the apple industry for the last half century. A

Pennsylvania R. R. official was asked by a New York apple buyer to direct him to two or three towns in this State where he could get a few carloads of certain kinds of apples. The railroad official told him of several towns in the Appalachian district of the State. The New York man went to that region but could not find any apples. In one town he rode around all day without success. Finally he went back to New York without having found any apples and sat down and wrote a somewhat sarcastic letter to the Pennsylvania official. It was for the Pennsylvania official to make good so he wrote him to come again, but in the meantime to put an advertisement in the local papers saying he would be in that town on a certain day to buy apples. He did so, and the railroad man took the trip with him. One car had been ordered and it was not long before it was filled, and still the farmers came in with wagon load after wagon load of apples. Another car was wired for, and still another, and as I recall, it was six cars that were filled—all the product of the old home orchards. Pennsylvania has done much with these farm orchards in the past and I believe she will continue to do so in the future. I want to make a special plea for the ten-acre orchard on the dairy farm and the general crop farm. There are thousands of farmers in the State to whom the planting of such an orchard should mean much because its care fits in well with other farming operations, and it serves as a profitable money crop.

In closing I would like to call your attention to four things. First, the wide range in this state of soils and of climatic conditions that are suited to commercial and less extensive forms of orcharding. Second, the long list of varieties high in quality that are now grown with profit—you need not worry at all about the quality you will be able to produce if you select the varieties that can be grown to advantage in your soil and climate. Third, cheap land—so cheap, in fact, that it may be found not far from any particular neighborhood where one wishes to live. Fourth, the best markets in the United States are nearby. A more complete combination of circumstances conducive to success cannot be found anywhere, and it seems to me that the prospects of extensive tree planting in this State are excellent.

A Member.—About the soil from Sunbury to Wilkes-Barre, what particular soil do you find there on the bluffs?

Prof. Wilder.—From Sunbury to Nescopeck the yellow Dekalb, and the red Upshur soils. Thence to Wilkes-Barre the Volusia and the Warren soils. All these soil series contain good orchard sites.

A Member.—You do not say much about the limestone soil.

Prof. Wilder.—No; I said I was going to leave out southeastern Pennsylvania because it was pretty well developed. What particular location of limestone soils do you refer to?

A Member.—None in particular; I was simply interested in a general way, particularly in the Cumberland Valley.

Prof. Wilder.—The Hagerstown or limestone soils there will grow apples very well where the elevation is fairly good. Some of the limestone areas have insufficient elevation for the best results, and some of the soils are rather heavy, but otherwise they should give good results. Other good apple soils may be bought more cheaply, but if one already has these soils he need not hesitate to plant. The so-called pine lands, occurring between the limestone soils there and South Mountain, are very promising.

A Member.—Bedford County?

Prof. Wilder.—You can find there every kind of soil I have described for the Appalachian Mountain and Valley region. There is a good opportunity there for orcharding.

A Member.—How about the northern part of Cambria?

Prof. Wilder.—Most of it is Dekalb soil, and you can grow there most of the New York or winter varieties. These soils are not generally as productive as some of the other soils, consequently it may cost you a little more to bring them to a productive condition but that is not difficult if suitable cover crops are grown.

A Member.—How about the limestone land at the foot of the Allegheny Mountain?

Prof. Wilder.—I will give you the same answer I gave to this gentleman over here in regard to similar soils in the Cumberland Valley. They are all right where the local air drainage is good.

A Member.—How is northern Bucks?

Prof. Wilder.—I have not been over it thoroughly, so I can answer only in a general way. Good orchard soils occur there but some of the blue shale soils south of Blue Mountain are poorly drained and very shallow. They are often marked by a scrubby growth of cedar from 3 to 6 or 8 feet high. It is well to avoid that soil.

Mr. Walton.—Professor, you have said very little about the southeastern portions of the state east of the Blue Ridge.

Prof. Wilder.—Between Blue Mountain and the Cumberland-Lebanon-Lehigh Valley and extending from Delaware Water Gap to the Maryland line there is a broad area of the Berks series of soils, the shale loam and the silt loam being the predominating types. These soils have not been developed in fruit as their worth warrants. The valley mentioned is occupied principally by the Hagerstown or

limestone soils, but it also includes many important areas of the Berks soils in the more rolling portions. Below the valley is South Mountain on which the Porters soils, the Mont Alto soils and the stony types of the Chester series are most extensive. All of these soil series include excellent fruit soils some of which are still for sale at very reasonable prices. Below South Mountain are important areas of the Penn soils—the red sandstone and shale soils of the Piedmont section, which may be contrasted with the red sandstone and shale soils of central Pennsylvania at much higher elevations, already referred to as the Upshur series. Interspersed with the red Penn soils are large areas of brown Chester soils derived from hard or granitic rocks. So well developed are these in Chester County that they were given the name of that county. Broadly speaking the Penn soils are fully as well adapted to peaches as to apples, while the opposite is true of the excellent Chester series. Some of the Brandywine soils in southern Chester, Lancaster and York counties are also moderately good but they are not quite as productive as the Chester. The Manor soils (white and red slate) are less desirable.

Mr. Walton.—Now if any one were to ask you what portion of the State to go to plant a commercial orchard, what would you say?

Prof. Wilder.—I would dodge every time. To save a few of my friendships I think I would ask him where he lived, and then call to his attention the best conditions in his own locality. If one wished to grow certain varieties or wished to cater to certain markets, then definite recommendations could well be made to suit the individual conditions. In the confusion of questions a moment ago someone asked about Monroe County, which contains considerable amounts of land too rough for profitable development on account of competition with smoother areas which are also low in price. This leaves Monroe County with a lower average of soil adapted to orcharding than some other counties, but nevertheless it is not at all difficult to find many good locations there.

A Member.—How about the soil I asked about on the east side of the river, and how about the west side of the river? (Central Pennsylvania).

Prof. Wilder.—Either is good. The Peach Yellows have attacked trees there but that does not trouble the apple.

A Member.—In the Cumberland Valley what about the sandstone?

Prof. Wilder.—Where do you find that in the Cumberland Valley? Do you refer to the Pine Lands?

A Member.—Yes.

Prof. Wilder.—That is very good; a good opportunity to grow fruit.

Prof. Surface.—What varieties are to be grown there?

Prof. Wilder.—York Imperial and Stayman Winesap. Jonathan is very worthy of more extensive trial, and the Pine Lands soil is well suited to it. The Gano does very well there, and I think the Rome Beauty well worth thorough trial. You have, of course, very good demonstrations there of several proven varieties.

A Member.—What about the soils in Lancaster?

Prof. Wilder.—The limestone land in Lancaster is very high in price, and just as good or better apple soils can be purchased for much less money. It is well adapted to Grimes Golden and some other of the green varieties. The red sorts often fail to color satisfactorily but York Imperial is profitable. Are you going to buy land or do you already own it?

A Member.—I own it.

Prof. Wilder.—What is it, lime or shale?

A Member.—Shale.

Prof. Wilder.—The shale soil is well worth developing. Well colored attractive fruit of the red varieties may be secured, and the land is reasonable in price. If I did not own any land and were going to buy there to plant fruit trees of any kind I would buy the shale in preference to the limestone.

A Member.—What is the reason for planting green varieties on the limestone?

Prof. Wilder.—In many seasons good color is not secured with the red varieties, especially the varieties of superior quality. With some weak growing sorts like Jonathan a better growth of tree is obtained on soils that are more mellow and porous than those of limestone origin. In some cases there may be additional reasons.

A Member.—I am particularly interested in that region running from Sunbury to Wilkes-Barre.

Prof. Wilder.—A good region for planting, and land is generally cheap. Avoid the bottoms of the narrow valleys. Good fruit soils are found well up the slopes and on the hills where frosts may be largely avoided.

A Member.—What varieties?

Prof. Wilder.—Northern Spy with Wagener filler if the latter plan of planting is desired. Stayman should also prove successful. Smokehouse is also excellent for a fall apple.

A Member.—How about the Baldwin?

Prof. Wilder.—The Baldwin has been very profitable but in certain sections the brown spot has given trouble, and there is some hesitation about planting it extensively until methods of control shall be perfected.

A Member.—Have you gone over York County and looked at the Pigeon Hills?

Prof. Wilder.—Yes, to some extent. The soils are favorable and reasonable in price.

Prof. Stewart.—The question has been raised back here, if you can get land at \$10 an acre that is considerably hilly, if it would not be better to add something to that price and get something more nearly like what you want?

Prof. Wilder.—I think so. In those sections even where land can be bought for \$3 an acre I would rather pay \$40 or \$50 than pay the three because the ultimate cost of production is likely to be less on the higher priced land.

Mr. Walton.—How about land at \$100 an acre?

Prof. Wilder.—It depends upon where it is located.

Mr. Walton.—South of the Blue Mountain. Would it pay to buy land at this price for the purpose of starting a commercial orchard on a large scale? There is a company being formed here in Harrisburg for that purpose with this end in view.

Prof. Wilder.—If near enough to special markets or other advantages to more than off-set the extra investment there is no reason why it should not be just as good a business venture, provided there is plenty of capital to carry it.

Mr. Walton.—They have plenty of money, but as a money-making proposition?

Prof. Wilder.—I think it all right up to a valuation of \$100 an acre, but good apple and peach soils may still be had in favorable locations in this state at one-half that price.

Mr. Walton.—These gentlemen are undecided whether to take land at that price, or land at \$10 an acre. The land at \$10 is pretty hilly.

Prof. Wilder.—Well, I would avoid very hilly land as a rule: spraying is much more difficult and all orchard operations are more expensive than on smoother ground. Many orchards were planted in Virginia and West Virginia before spraying became necessary,

and it is almost impossible to spray some of them. I would almost rather pay \$200 an acre for smoother land than to meet the extra expense of spraying on ground that is too steep. That applies to a good bit of the Albemarle Pippin region.

A Member.—Do not the apples get larger on the limestone soil?

Prof. Wilder.—Not necessarily. I think the shale soil can be handled so as to get just as large fruit. I have seen just as fine Smokehouse apples grown on the sandstone soils near Sunbury as anywhere else. I would not plant the trees quite so thickly on the limestone soil so as to allow for a heavy growth.

A Member.—I am a representative of Bedford County. We have wonderful possibilities over there, and we want you people to come over and see what we have to offer before you decide to buy elsewhere. We have the soil and we have the climate, and every opportunity that any one can ask. You can get land from \$20 to \$50 an acre, the very best orchard land that can be had.

Prof. Wilder.—I know the soil is there, likewise the opportunity, and several counties in that part of the State which have not been mentioned individually have comparable soil conditions.

Mr. Wertz.—Every mother thinks her baby the prettiest. Franklin County is just the same.

A Member.—What about the possibilities of the Pocono Mountains?

Prof. Wilder.—That is mostly sandstone soil which occurs at higher elevation than the shale. It will cost a little more per acre to bring that soil into a good productive condition than some others. Along the D., L. & W. railroad from Scranton to New York the land over those mountains is exposed to high winds, and that may cause some little trouble with the fruit, especially about blowing off. Then there are other conditions to be considered. You are altogether dependent on one railroad and the cost of transportation under such conditions may prove to be an important item. My remarks do not refer, of course, to the railroad concerned in this case but to a general condition of transportation.

RECENT ADVANCES IN OUR KNOWLEDGE OF LIME-SULPHUR.

By J. P. STEWART, *Experimental Horticulture, State College, Pa.*

Owing to the increasing interest in the subject, I have been asked again to run over the details of making concentrated lime-sulphur. Details are hard to remember, however, and since they are already available for the asking in our Bulletin 99, it has seemed to me wiser to deal here with some of the more general phases of the

subject, presenting rather the principles upon which the details depend. In doing this, it has seemed best to trace out the development somewhat along historical lines, adding briefly in their proper places those features of most importance that we have learned during the past year.

As we have noted before, the career of lime-sulphur as a spray material has been rather checkered. Starting in 1886 at Fresno, Cal., when a Mr. Dusey borrowed a pail full of sheep dip from his neighbor, Covell, thinking that if it killed the lice on sheep it ought also to do it on trees, it speedily became the leading contact insecticide throughout the Pacific Coast. It was then brought East in 1894, soon after the discovery of scale in Virginia, was tried in Maryland, and discarded, being found apparently useless under eastern conditions. It was partially revived by Marlatt in 1900, but failed to secure wide acceptance until after the work of Forbes and others in 1902. From the latter date until approximately 1909, it remained the standard insecticide throughout the country, in spite of its many objectionable and disagreeable features. This was the old, home-boiled, dilute mixture which finally came to be made by using 15 or 20 pounds of lime and 15 pounds of sulphur to 50 gallons of total product.

While this development was taking place in the dilute mixture, another preparation, without the objectionable features, was gradually coming to the front. This was the so-called commercial or factory-boiled lime-sulphur. It was storable, free from sediment, easily applied, and though much denser than the home-made preparation, it was practically free from crystals. Just when and by whom it was first used as an insecticide, I have been unable to discover. It appears, however, that along in 1902 or 1903, a Stock Food Company of Omaha learned that some of their patrons in Utah were buying a few extra barrels of a concentrated cattle-dip for application to trees. Later inquiries and tests showed the value of this, and from that beginning has developed the present remarkable production of commercial lime-sulphur materials. Both types of lime-sulphur insecticides, therefore, came into use rather accidentally and apparently independently, as the result of a transfer in use from dip preparations.

Along in 1908, when the writer became interested in the situation, the making of these dense, non-crystalizing insecticides was supposed to be accomplished by some difficult, factory process, wholly beyond the capabilities of the orchardist, and consequently worth about three times as much to him as we now know they can be readily made for at home.

At this time it was learned that Cordley in Oregon had made a "stock solution" lime-sulphur. Details of his work were meager, however, and not generally available. There also appeared to be some doubt as to the correct ratio of lime to sulphur, and the proper concentration to be used. For example in the version of his formula given by Parrott,¹ a 60-to-125 ratio was advised, while in his own

¹ New York Geneva Bul. 319.

later account,² 60-to-110 was used; the latter ratio having appeared in 1906 in a formula used by Thatcher, at one-half the present weights.³ As to concentration used, it appears that with the larger amounts of ingredients⁴ only enough water was added at first to make 45 gallons of mixture, while with the smaller amounts the total was brought up to 60 gallons. No further additions of water were indicated in either account to make up for the losses in boiling, which was to be for one hour or more. After boiling and settling, only the clear liquid obtainable above the sediment was drawn off; and in the former case this amount of liquid was diluted to make the final 50 gallons of concentrate. This was again diluted for use, at the rate of 1 to 10 (total), and the sediment was to be re-used in succeeding boilings.

The faults and uncertainties of this method are very evident now; and it was doubtless fortunate for the home-made concentrate that no wide attempt was made to strictly carry it out in orchard practice. It is of interest, however, as marking the advance made up to the early part of 1909.

The next move was made at the Pennsylvania Station. The work had begun before the above accounts appeared, though most of their facts were known. The general attitude and prospects for success at that time may be gathered from a remark by one of our leading insecticidal chemists, then at the Station, whom the writer was trying to enlist in the cause. His advice was to go ahead with the work but not to be disappointed in case nothing was learned, because the whole subject had been studied thoroughly already by chemists, and nothing new was to be expected.

The results of the subsequent work have appeared in various places, and we can here merely mention some of the leading points established.⁵ We found that the crystals occurring in the old, dilute preparation were due to excess of lime. The value of this excess was questioned and later proved to be unnecessary against scale, as was already known in the case of fungi. The cause of the crust which develops over concentrates was shown to be due to exposure to air, and its prevention was readily accomplished.

The proper ratio of lime to sulphur was studied, and the ratio of these materials *in solution* was found not to be constant as Thatcher supposed (Wash. Bul. 76) but to vary primarily with increase in density.⁶ Thus in dilute solutions the ratio occasionally ran as low as 1 to 1.8, while in dense concentrates it averaged about 1 to 2.5, with individual cases much higher. Owing to losses in making and impurities in the best of our commercial limes, however,

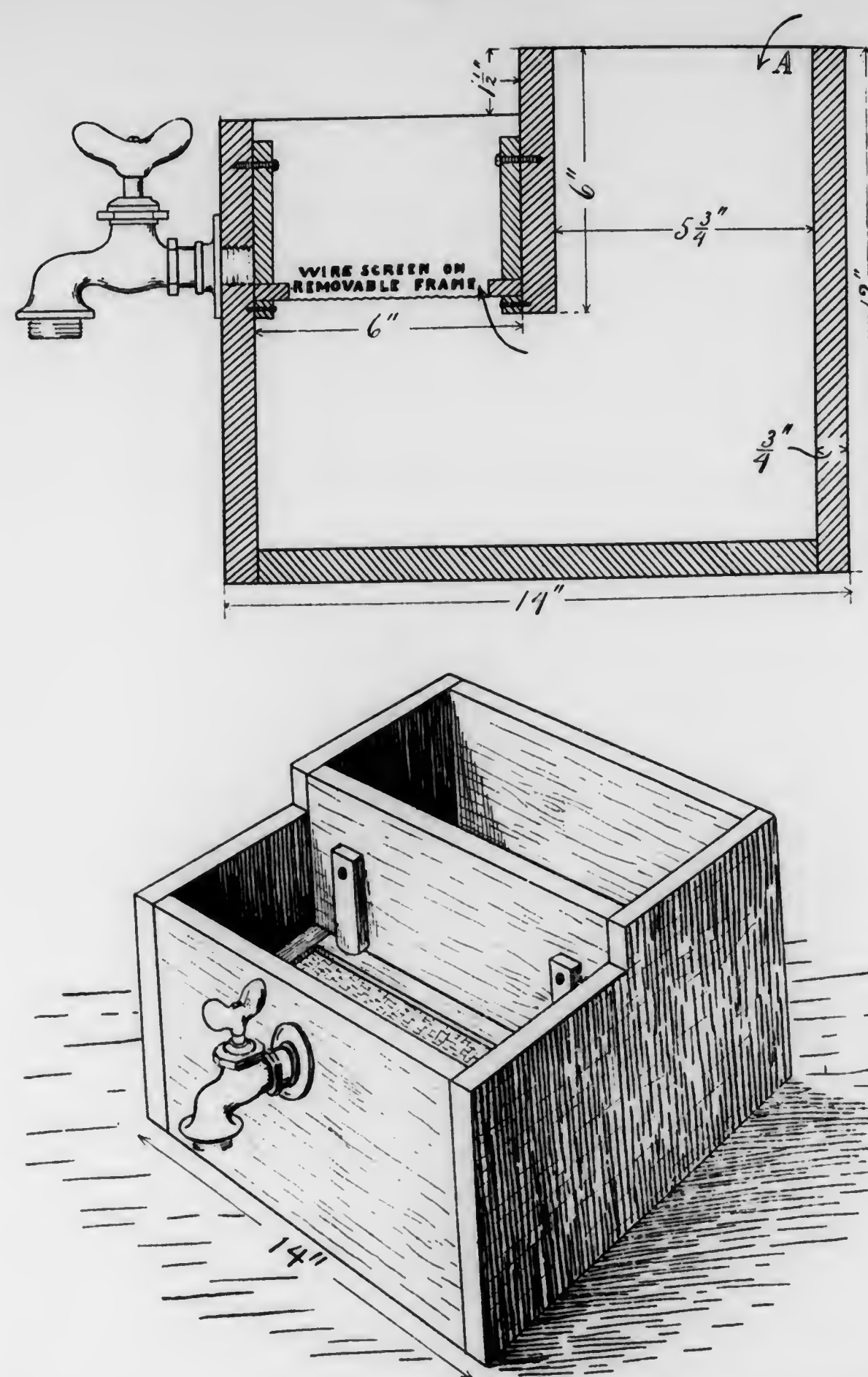
² Cordley. Better Fruit, April, 1909.

³ Washington Bulletin 76.

⁴ 60 pounds of lime to 125 pounds of sulphur.

⁵ For details and data, see Pennsylvania Station Reports for 1908-09 and 1909-10; Bulletins 92, 99 and 106; Report of the Society for Horticultural Science, 1909; and Rural New Yorker 1910, pp. 944 and 1096. Bulletins 99 and 106: 11-13 contain the essentials of making and use, in condensed form.

⁶ The ratio of lime to sulphur in solution is also apparently affected somewhat by ratio of ingredients.



FIGURES 1 AND 2.—(Original). A new type of strainer for lime-sulphur or other spray materials. The liquid enters at "A," passes upward through the screen and is carried where desired through a hose attached to the spigot. The coarse particles thus fall away from the screen instead of accumulating on it. Any solution retained in the sediment may be secured by running through it the water required for the next boiling.

we found definitely that for orchard conditions the *best ratio of ingredients* is one pound of high calcium lime to two pounds of sulphur.

In connection with the matter of concentration, the relation existing between volume, density and utilization of materials was determined. The greater densities, obtainable with lower volumes of concentrate, were shown to be *associated with less economical use of materials*, and hence to be undesirable. Where storage conditions are to be met, however, a final volume of 1 to 1.1 gallons of total product is about right in the home preparation, for the weights of ingredients named above. Otherwise somewhat greater volumes may be used, diluting according to density in all cases.

The sediment in properly made concentrates was found to *actually* occupy much less than ten per cent. of the total volume, though by settling alone it *apparently* occupied 30 to 50 per cent. Most of it is unobjectionable in the home preparation, but for more readily removing its coarser portions, we have recently made a new type of strainer, the construction of which is shown in the accompanying figure. The usual clogging is avoided in it by straining upward, the coarse particles falling away from the screen instead of accumulating on it as in other strainers.⁷

The amount of sediment was found to be influenced by the manipulation, by the ratio and purity of the materials, and by the amount of boiling. The best index for completed boiling is the evident dissolving of the sulphur granules.

Ordinary winter temperatures were found not to exert any permanent effect on the concentrates, the only danger in freezing apparently being the possible breakage of containers, and the freezing points lowered with increase in density. Acids and carbon dioxide, however, readily break down the solution.

In connection with the *use of lime-sulphur*, the first definite system of dilution according to density was developed, foliage tests were made, some of the conditions influencing spray injury were determined, and the thorough control of scale on apple by summer applications alone was demonstrated. This was accomplished with three sprays, the first being applied immediately after the young began to emerge with the others following at intervals of about ten days, when additional young were observed.⁸ The amount of spray injury was found not to depend exactly upon density of application, but rather upon the density attained on the leaf before evaporation is complete. This was affected by the abundance of application, the density of the material applied, and the size and location of the drops retained by the leaves, the younger leaves and under surfaces being most vulnerable.⁹ Injury is also especially liable to occur when lime-sulphur is used after applications of bordeaux or after previous applications of lime-sulphur which have

⁷ For fuller account of this strainer, see Rural New-Yorker 1911, p. 276.

⁸ See our Annual Report for 1909-10, and the Rural New-Yorker 1910, p. 944.

⁹ Pennsylvania Report 1908-09: 286-89; and Bul. 99: 15.

broken the epidermis. This accounts for some of the anomalous cases of severe injury that have come to our attention during the last two seasons.¹⁰

The recent work at various other stations cannot be adequately treated in the present space. The general outburst of activity along all lines of sulphur sprays has been quite remarkable. The excellent work of Scott at Washington in showing the usefulness of the self-boiled preparation, especially in the control of peach diseases, and also of Quaintance in showing its value in the summer control of scale on peach are worthy of special note. Wallace's extensive work at Cornell against apple diseases, his development of a laboratory method of testing fungicides, his demonstration of the special value of the lime-sulphur-lead-arsenate combination, and his emphasis of the relation between broken epidermises, by scab or insects, and lime-sulphur injury are also noteworthy. This injury is thus brought in line with that of Bordeaux, as pointed out by Crandall in Illinois, and with that of arsenicals, as pointed out by Gillette in Iowa (Iowa Bul. 10. 1890). Parrott, at Geneva, has demonstrated the value of sulphur sprays against blister mite, and has shown the worthlessness of the sediment against scale. Van Slyke and Bosworth at the same place have emphasized the general undesirability of magnesium in the lime used in the ingredients; and Waite at Washington has called attention to possible values of copper and iron sulphids. Besides these workers, Taylor in Missouri, Fulmer and Caesar in Ontario, Bonns in Maine, Ballard and Volck in California, and many others are doing their share in the present movement of advancing, verifying and perfecting our knowledge of the making and use of sulphur sprays, and still there is work to be done.

THE SUMMER SPRAYING OF PEACHES.

By J. P. STEWART, *Experimental Horticulturist, State College, Pa.*

During the season of 1910, an opportunity was offered to the Department of Experimental Horticulture, at State College, to make some further studies on the summer spraying of peaches. A block of trees in the extensive orchard of Mr. W. Fred Reynolds of Bellefonte was very kindly offered for this purpose, and the necessary additional assistance was provided in the Department.¹ The results secured, though not conclusive in all cases, are believed to be of sufficient interest to warrant presentation at this time, especially as a report of progress.

The primary object of spraying peach orchards in summer is to control brown rot. The control of curculio is a pre-requisite for

¹⁰ Rural New-Yorker 1910: 1096; and Penna. Bul. 106: 11-13.

¹ One of our advanced students, Mr. W. H. Sill, had direct charge of the work, during the writer's absence, and much of the success attained is due to him. Excellent service, in addition to his other duties, was also rendered by Mr. H. F. Hershey, regular assistant in the Department.

this, and the practical prevention of peach scab, the black spotted disease that often cracks the fruit and makes it more or less lopsided, is incidentally secured. The object in our work was essentially to try out the best known method² of accomplishing these ends, and to compare it with other available sprays in order to secure possible improvements. The relative safety of these sprays upon the foliage and fruit was also considered, as well as their effect upon the carrying quality of the fruit in shipment.

For the experiment, a block of some 280 trees about 10 years old was chosen. The peach trees were Early Crawford, which had been planted as fillers among apples, every fourth tree being the latter. This variety was chosen especially because in previous years it had shown more rot than the others in the orchard, and its trees were well covered with blossoms.

Outline of the Experiment.

The plan of the experiment involved three sprayings and nine different treatments, with appropriate "buffers" and checks. In the *first spraying*, all plots except the checks were treated alike, using lead arsenate, lime and water at the rate of 2-2-50³. This application was aimed primarily at the curculio and was applied on May 19, just as the calyces or "shucks" were shedding. The *second application* was made a little less than a month later, on June 11 and 14, the "data" trees being all sprayed on the 11th. At this time the different fungicide and arsenical combinations named below were applied. In the *third spraying*, the arsenicals were omitted, the application being made on June 24. For best results in controlling the diseases this third application should have been deferred for 3 or 4 weeks, since the fruit proved not to be ready to pick until August 23, or about 8 weeks after our last application, when it should have been only about a month between these dates. All treatments were under the same conditions, however, so that for purposes of comparison the experiment was not appreciably affected.

The materials used in the second and third applications (with arsenicals omitted in the third) were as follows:

Plot I. Check. (Unsprayed throughout).

Plot II. "Buffer." (Three rows of trees, sprayed as in Plot 3, that were included between the data trees and unsprayed portions to avoid undue exposure of the former to sources of infection).

² The self-boiled lime-sulphur treatment proposed by Scott of United States Department of Agriculture, Bureau of Plant Industry, Bul. 174, 1910.

³ The lead arsenate was the same throughout the experiment, being kindly furnished us for the purpose by the Grasselli Co., of Cleveland, Ohio. The lime throughout was high in calcium, about 95 per cent. CaO; and the water used was rain water obtained from a cistern. In all cases the applications were fairly heavy, averaging about 2½ gallons to the tree. They were made with a barrel hand-pump in all cases excepting the second and third applications on Plot VI, in which a Niagara gas sprayer was used.

Plot III. Self-boiled lime-sulphur, 8-8-50; and lead arsenate, 2 pounds to 50 gallons. (Made as described by Scott, in U. S. D. A., Bur. of Ent. Cir. 120: 5-7; and B. P. I. Bul. 174, 1910).

Plot IV. Lime-sulphur solution, 1.003; and lead arsenate, 2 lb. to 50 gal. (The applied lime-sulphur solution in all cases was made as described by the writer in Penn. Bul. 99, 1910. A density of 1.003 is approximately equal to a dilution of 1 to 100 of our best commercial lime-sulphurs, those testing 1.30 Sp. Gr. or 33½° Baume).

Plot V. Lime-sulphur solution, 1.003; and arsenite of lime, 2 pints to 50 gallons. (The arsenite of lime here and in Plot VIII was made as described in Penn. Bul. 99).

Plot VI. Lime-sulphur solution, 1.003; and lead arsenate, 2 lb. to 50 gal.; applied with carbon dioxide gas sprayer. (This was expected to eliminate the burning by precipitating the sulphur, without losing the fungicidal action).

Plot VII. Sulfocide, 1 to 400; and arsenite of lime, 2 pints to 50 gal. (This combination was not advocated by the manufacturer but was tried to determine results, since we had evidence that the Paris green recommended was unsatisfactory).

Plot VIII. Sulfocide, 1 to 400; an darsenate of lime, 2 pints to 50 gallons. (Tried for reasons indicated in VII).

Plot IX. Pyrox, 5 pounds to 50 gallons of water. (This is a commercial preparation of bordeaux and lead arsenate, which has given good results on apples. It was tried here a little stronger than the manufacturers recommended, but apparently is not desirable for peaches, as later results show).

Plot X. Bordeaux, made with ½-pound copper sulfate, and 6 pounds lime to 50 gallons of water; and lead arsenate, 2 lb. to 50 gal. (This spray was formed by doubling the amount of CuSO₄ in the next for comparison with it).

Plot XI. Bordeaux, ¼-6-50; and lead arsenate, 2 lb. to 50 gal. (This spray was recommended as having been in successful use for several years, in Van Lindley orchards of Southern Pines, North Carolina).

Plot XII. Buffer. (Sprayed like XI. See Plot II).

Plot XIII. Check. (Unsprayed).

The plots were adjoining and contained 20 trees each in double rows, excepting II and XII, which contained 30 trees each, in three rows. The data on all plots were taken from 5 or 6 central trees, thus providing in all cases a "buffer" of at least three sprayed rows between the sprayed data trees and unsprayed conditions. It will be noted that the experiment contains six sulphur treatments, and three Bordeaux.

The Weather.

The weather during the time of the experiment was as follows:

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Date	Temperature.			
	Maximum	Minimum	Mean	Precipitation
15	56	38	47	0
16	66	34	50	0
17	70	40	55	0
18	66	48	57	.19
19	76	48	62	0
20	72	53	63	.23
21	78	60	69	.20
22	75	55	65	Trace
23	67	56	62	.02
24	80	57	69	.75
25	72	55	64	.05
26	63	46	55	0
27	60	40	50	Trace
28	74	47	62	0
29	77	45	56	.10
30	61	49	55	0
31	50	41	46	Trace

JUNE.

Date	Temperature.			
	Maximum	Minimum	Mean	Precipitation
1	52	40	46	.13
2	64	44	54	Trace
3	62	47	55	.47
4	67	40	54	0
5	59	51	55	.58
6	72	51	62	.03
7	60	47	54	.02
8	74	45	60	0
9	69	45	57	.47
10	59	49	54	.12
11	58	50	54	.69
12	62	52	57	.15
13	72	50	61	0
14	78	55	67	0
15	81	56	69	0
16	69	59	64	.28
17	80	60	70	Trace
18	80	61	71	.07
19	83	60	72	0
20	87	59	73	0
21	88	59	74	0
22	87	64	76	0
23	88	64	76	0
24	80	62	71	0
25	80	50	65	0
26	78	55	67	0
27	81	64	73	.01
28	80	60	70	.77
29	84	60	72	0
30	87	62	75	0

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JULY.

Date	Temperature.			
	Maximum	Minimum	Mean	Precipitation
1	89	64	77	0
2	88	67	78	0
3	78	65	72	Trace
4	76	65	71	Trace
5	79	52	66	0
6	82	57	70	0
7	76	57	67	.90
8	86	64	75	0
9	86	60	73	.31
10	87	62	75	.08
11	86	60	73	0
12	84	61	73	.81
13	82	66	74	.35
14	83	53	68	0
15	84	60	72	0
16	85	62	74	.08
17	73	60	67	.53
18	74	55	65	Trace
19	75	51	63	0
20	81	51	66	0
21	72	59	66	0
22	84	60	72	0
23	85	67	76	.15
24	91	63	77	0
25	86	63	75	0
26	80	62	71	0
27	83	58	71	Trace
28	79	61	70	.83
29	84	54	69	0
30	80	64	72	.02
31	75	53	64	0

AUGUST.

Date	Temperature.			
	Maximum	Minimum	Mean	Precipitation
1	78	46	62	0
2	85	54	70	0
3	88	50	69	0
4	86	71	79	Trace
5	74	56	65	0
6	77	48	63	0
7	79	53	66	0
8	72	59	66	.66
9	77	56	67	.02
10	74	58	66	.78
11	80	58	69	.02
12	80	54	67	0
13	81	54	68	0
14	83	58	71	0
15	84	58	71	0
16	78	63	71	0
17	75	66	71	0
18	73	62	68	.37
19	75	64	70	.22
20	77	49	63	0
21	79	49	64	0
22	76	60	68	0
23	82	60	71	0
24	82	64	73	0
25	84	64	74	0

Results.

Since the injury caused by the spray itself is one of the most important matters in peach spraying, special attention was given to it throughout the experiment. The extent of the injury as well as its nature was noted. The amounts of twig injury and of fruit and leaf-drop were determined by trial counts and estimates. The injury to the picked fruit was determined by the random-sample method described below. The approximate maximum injuries are shown in Table II. These injuries were not all at their maximum at the same time, those from the Bordeaux preparations developing most slowly. The fruit drop recorded against the checks approximates that occurring on the unsprayed trees from various causes, up to picking time.

TABLE II.

Effect of Sprays on Fruit, Foliage and Twigs.

Plot	Treatment	Fruits in Sample*	Injured by Spray	Per cent. Fruit Injured	Per cent. Fruit Drop	Per cent. Twig Injury	Per cent. Leaf Drop
I.	Check,	549	0	0	5-10	0	0
III.	Self-boiled lime-sulphur and Arsenate,	430	0	0	0	0	Some shot-hole injury
IV.	L-S and Arsenate,	424	0	0	5	5	5
V.	L-S and Arsenite,	487	11	2.26	5	5	10
VI.	L-S and Arsenate applied with CO ₂ ,	453	49	10.8	50	20	50
VII.	Sulfocide and Arsenate, ...	245	17	6.94	90	70	90
VIII.	Sulfocide and Arsenite, ...	359	38	10.58	40	30	50
IX.	Pyrox (5-50),	377	178	47.2	50	50	65
X.	Bordeaux (½-6-50) and Arsenate,	515	55	10.7	1	0	considerable shot-holing
XI.	Bordeaux (¼-6-50) and Arsenate,	459	43	9.8	5	0	considerable shot-holing
XIII.	Check,	495	0	0	5-10	0	0

It will be readily observed that the amount of injury to fruit, foliage and twigs is so great in treatments VI to IX as to rule them out at once from serious consideration as summer sprays for

*In this table and those following, the effect of the various treatments on the picked fruit was determined in all cases by the random-sample method. In obtaining these samples, *all* the fruit on the data trees of a given plot was picked and weighed. From each basket of this fruit a sample was taken at random and placed with other similar samples, enough being taken from each basket to make a total of one or two bushels in the total sample from each plot. This fruit was carefully examined for rot, scab and curculio or spray injury, and the per cent. of each found in the sample was considered to be a correct representation of the fruit conditions of the plot. The accuracy of this method of course increases with the number of fruits in the sample. In most cases our numbers seemed to be large enough. But from the results obtained in one or two instances as indicated later, it seems probable that some injustice was done.

peaches. From the injury to the fruit, this is also practically true of X and XI; with V in the doubtful class, despite its efficiency which appears later.

The nature of the injury is of special interest, primarily because it is only through a correct understanding of its nature that we can hope to learn its control, either on peaches or other fruits. In plots VI, VII, IX and X for example, the *injury to the fruit* was apparently identical in character, though the fungicides evidently varied. There can be little doubt, therefore, that this injury is directly due to the arsenical, since it is the only common material, and also since a similar injury is reported by Haywood and McDonnell⁴ where lead arsenate only was used.

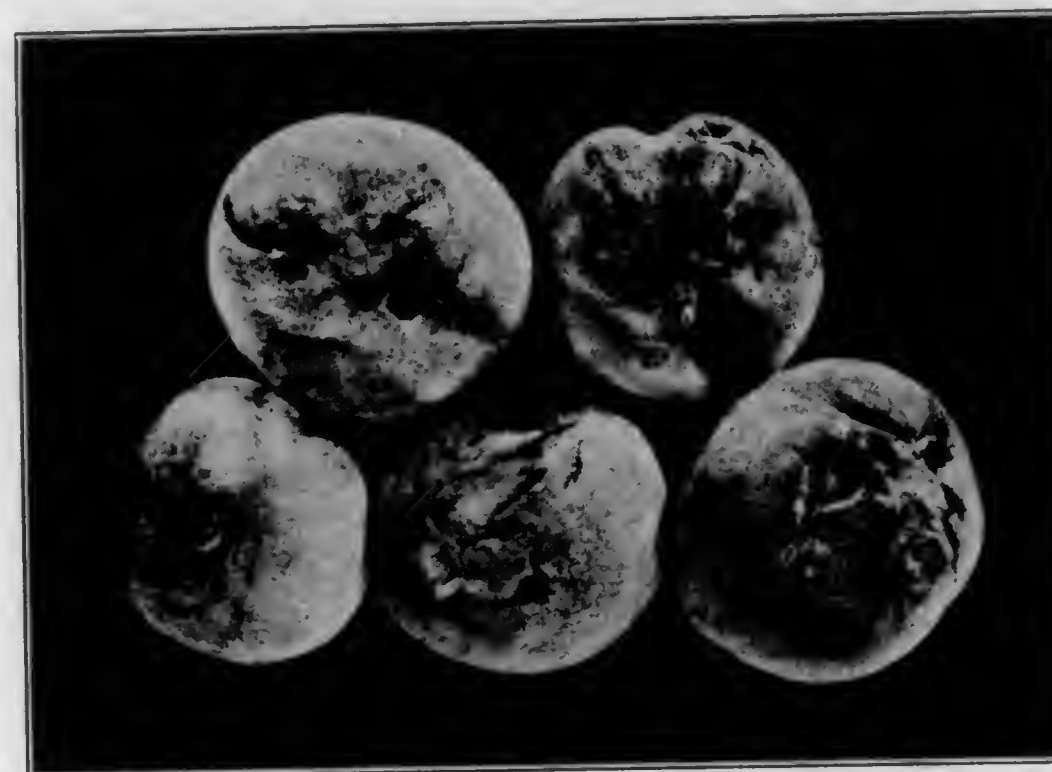


FIGURE 1.—Typical injured peaches from plots VI to XI. The injury is apparently due to the arsenical directly, with the fungicide aiding indirectly.

The general appearance of the injury on the picked fruit is shown in Figure 1. Most of the dropped fruit on these plots was similarly affected. The injury was most frequent where the spray material had collected on the fruit in some quantity, especially between the fruit and its adjacent twig or between fruits, and dried. The injured portion became dark, sunken, more or less hardened and leathery, and frequently cracked away from the sound portion and emitted gum. The injury to the foliage and twigs is also doubtless largely of the same nature, though not of necessity entirely so, since it is well known that the foliage is quite susceptible to some injury from the fungicides alone, even at the low strengths used.

Assuming then that the injury to the fruit at any rate, is primarily due the arsenicals, the question arises as to how it is brought about. The arsenate evidently did not become soluble with water and lime alone, in sufficient quantities to cause the observed dam-

⁴ U. S. Bureau of Chemistry, Bul. 131: 36-37. 1910.

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IV.	L-S and Arsenate,	424	0	0	5	5	5
V.	L-S and Arsenite,	487	11	2.26	5	5	10
VI.	L-S and Arsenate applied with CO ₂ ,	453	49	10.8	50	20	50
VII.	Sulfocide and Arsenate, ...	245	17	6.94	90	70	90
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age, as is apparently proved by the fact that no perceptible injury resulted in $3\frac{1}{2}$ weeks following the first application. Atmospheric carbon dioxide, which has been suggested as the possible dissolving agent, appears to have no action on lead arsenate directly, since Haywood and McDonnell⁵ have found that lead arsenate of either composition, PbHAsO_4 or $\text{Pb}_3(\text{AsO}_4)_2$, is rather "less soluble in distilled water saturated with carbon dioxide, even when heated to 50°C ., than in cold distilled water free from carbon dioxide." Certain salts, especially of sodium, when present in the spray water even in relatively small quantities, are well known to exert a very marked solvent action on lead arsenate.⁶ But even this can hardly have been operative in our results, since only rain water was used. Our conclusion therefore is that the addition of the fungicides, especially those in soluble form, have acted like other salts in solution, and have brought about the dissolving of the arsenicals.

In plot III, the fungicide was not in solution to any appreciable extent, hence little or no action.⁷ In IV, a reaction occurs, but the dissolved arsenate is reprecipitated as rapidly as formed, probably largely as calcium arsenate, and thus the injury is relatively slight. In plot VI, however, where carbon dioxide also is added, soluble arsenic was evidently set free in considerable quantities. The gas therefore was apparently able to break down the secondary compounds formed in IV, probably changing the arsenate of calcium to the carbonate in the process. Regardless of the exact reaction, however, the use of the gas sprayer in connection with the combined lime-sulphur arsenate spray is obviously very dangerous and not to be recommended. On the other hand, in the third application with the gas and lime-sulphur alone, no additional damage was done to the trees of the plot and none whatever to adjacent trees sprayed only at this time. In this plot, therefore, all the injury is unquestionably due to modifications in the arsenical.⁸

In plots VII and VIII, this solvent action of the fungicide upon the arsenicals is very evident and easily explained. Here we had a material, Sulfocide, that according to our analysis is a soda-sulphur compound, to which has been added a neutral organic substance that renders it viscid. It has been used alone on peaches, at 1 to 400 with no appreciable injury. But when either of the arsenicals used by us is added, there results the excessive injury shown in Table II. The addition of paris green is evidently no safer than that of lead arsenate, as indicated by the results of Dr. Clinton in Connecticut,⁹ and also by disastrous results on pears

⁵ U. S. Bureau of Chemistry, Bul. 131: 45-46. 1910.

⁶ U. S. Bureau of Chemistry, Bul. 131: 46-48; and Headden, Colo. Bul. 131: 22. 1910.

⁷ In any case the reaction can occur only to the extent in which both reacting materials are in solution, a point which seems to have been lost sight of in many discussions of this subject.

⁸ Similar results are reported by Wallace, in a forthcoming bulletin, No. 288, of the Cornell Station.

⁹ Connecticut Report 1909-10, p. 611. In our results, it is noteworthy that the injury with arsenite of lime was only about half that with lead arsenate, though of course neither arsenical is usable in this combination.

obtained this past season by our President, Mr. Hiester. In short, the soda-sulphur fungicide in this case acts like other sodium salts in rendering soluble the arsenicals combined with it. Similarly in plot V, it is probably the trace of sodium that still remains in our preparation of the arsenical, which is responsible for the burning obtained, since calcium arsenite itself is apparently less soluble than calcium arsenate, which is formed to some extent in IV. The action with Bordeaux, in plots IX to XI, may be somewhat different, but it is of less importance to us in this discussion.

Summary of Spray-Injury.—In this whole matter of sulphur-arsenical injury therefore it seems (1) that when used at proper dilutions, most of the injury is due directly to the arsenical, but indirectly to the solvent action of the fungicide used with it; (2) that certain sulphur sprays are entirely unusable with present arsenicals since they contain soda; (3) that the use of spray water containing appreciable quantities of sodium salts, or the use of commercial lime-sulphurs to which sodium or potash salts have been added, is especially dangerous in connection with arsenicals; and (4) that the solving of the spray injury problem, so far as it depends on the materials themselves, probably consists in the elimination of the solvent action of the fungicide by properly putting it out of solution, coupled with the use of an arsenical of the highest grade. The details of this process, we expect to try to work out in the future.

TABLE III.

Effect of Sprays on Yield and General Soundness of Fruit.

Plot	Treatment	Total Yields Lb.	Picked Fruit Lb. per Tree	No. of Fruits in sample	Number entirely sound	Per cent. sound
I.	Check,	258	50	671	34	5.07
III.	Self-boiled and Arsenate,	427	84.3	463	302	65.7
IV.	L-S and Arsenate,	547	108.4	475	310	65.47
V.	L-S and Arsenite,	399	79.2	562	414	73.6
VI.	L-S and Arsenate applied with CO ₂ ,	359	70.4	627	428	68.2
VII.	Sulfocide and Arsenate,	177	34.8	322	171	53.1
VIII.	Sulfocide and Arsenite,	342	66.7	485	298	61.5
IX.	Pyrox (5-50),	299	50.9	1107	667	60.34
X.	Bordeaux (1/2-6-50) and Ar- senate,	649	127.8	679	502	73.9
XI.	Bordeaux (1/4-6-50) and Ar- senate,	564	110.1	459	322	70.3
XIII.	Check,	374	72.9	612	101	16.5

In Table III, we have a partial representation of the influence of our treatments upon yield and general soundness of the fruit.

*The samples in this case include both picked and fallen fruit and in all other tables picked fruit only is considered.

We say "partial" because the yield differences are only partially attributable to the sprays, the differences being chiefly due to variations in the original crops, in the size of the trees, and in the amount of thinning. Some of the low yields, however, those on plots VII and IX, are rather directly connected with the materials applied, on account of the resulting fruit drop. The generally higher yields of the other sprayed plots, as compared with the checks, are also doubtless due to reduction of loss from curculio and rot.

The differences in soundness are more significant. On the checks, the perfectly sound fruit ran from 5 to 16.5 per cent., while on the best sprayed plots it ran from 65 to 73 per cent. It will be observed that the bordeaux ($\frac{1}{2}$ -6-50) has given the highest per cent. of sound fruit, followed very closely by the sulphur solution and lime arsenite. Plots III and IV, however, were lowered in soundness primarily by their greater damage from curculio, shown later in Table III. With this exception their fruit was the best of all.

The soundness of the fruit on VI is also notably high, thus showing that the fungicidal properties were not lost by the precipitation of the sulphur. The injury came quickly on this plot, the damage being done by the second spraying; and recovery was also very rapid.

Effect of the Sprays on Color.—The fruits remaining on the tree, in plot VI especially, averaged large and were *extremely brilliantly colored*. This was probably due to stimulation by the arsenic, when present in less than killing strengths, coupled with the decreased foliage which admitted more light to the fruit. A similar increase in color appeared in all the sprayed plots, the increase being roughly proportional to the severity of the arsenical injury.

TABLE IV.

Effect of Sprays on Curculio.

Plot	Treatment	No. of Fruits in sample	No. injured by curculio	Per cent. injured
I.	Check,	549	135	24.7
III.	Self-boiled and Arsenate,	430	120	27.9
IV.	L-S and Arsenate,	424	88	20.75
V.	L-S and Arsenite,	487	14	2.9
VI.	L-S and Arsenate, applied with CO ₂ ,	453	42	9.27
VII.	Sulfocide and Arsenate,	245	51	20.8
VIII.	Sulfocide and Arsenite,	359	13	3.62
IX.	Pyrox (5-50),	377	13	3.45
X.	Bordeaux ($\frac{1}{2}$ -6-50) and Arsenate,	515	41	7.96
XI.	Bordeaux ($\frac{1}{4}$ -6-50) and Arsenate,	459	22	4.8
XIII.	Check,	495	129	25.1

Table IV shows the effect of the treatments in controlling curculio. It contains some surprising results, some of which may be due to accidents of sampling or to other elements of chance within the experiment, and more repetitions are needed before drawing final conclusions. The first surprise is in the remarkable efficiency displayed by arsenite of lime, in the second application, in both plots in which it occurs (V and VIII). The other is the equally surprising failure of lead arsenate in certain of its plots III, IV and VII). We do not attempt to explain this, further than to say that some of the inequalities are due to the fact that the dropped fruit was not here considered and, in the rotted fruit, the curculio injury was often obscured so that it could not be recorded with certainty. The plots with considerable dropping and rotting therefore doubtless escaped being charged with some of their insect injury. The relative injury is presented, however, because of its bearing upon some of the results that follow.



FIGURE 2.—Unsprayed apples, showing effects of curculio. These marks are caused by feeding or egg-laying punctures that failed to develop larvae. When the eggs hatch, the fruit drops.

An interesting by-product was secured in this connection in some remarkable control of curculio on the apple trees within the experiment, which were sprayed along with the peach. The condition of the apples on unsprayed and sprayed trees is shown in Figures 2 and 3. These results held practically throughout the experiment.

The control of curculio in this case is the more remarkable because of the relatively late applications of the arsenicals, the first spraying being about 10 or 15 days after petal fall on the apples, and the second about three and one-half weeks later, as indicated above. Incidentally, we may say that the control of curculio is doubtless of more importance on apples than is generally supposed. We know of one instance, for example, where over 80 per cent. of the June drop apples were found affected with curculio larvæ. We have been told heretofore that, in the apple, if the fruit drops the egg of the curculio hatches. In the writer's opinion, it is probably more correct to say that if the egg hatches, the fruit drops, the former statement merely having "the cart before the horse."

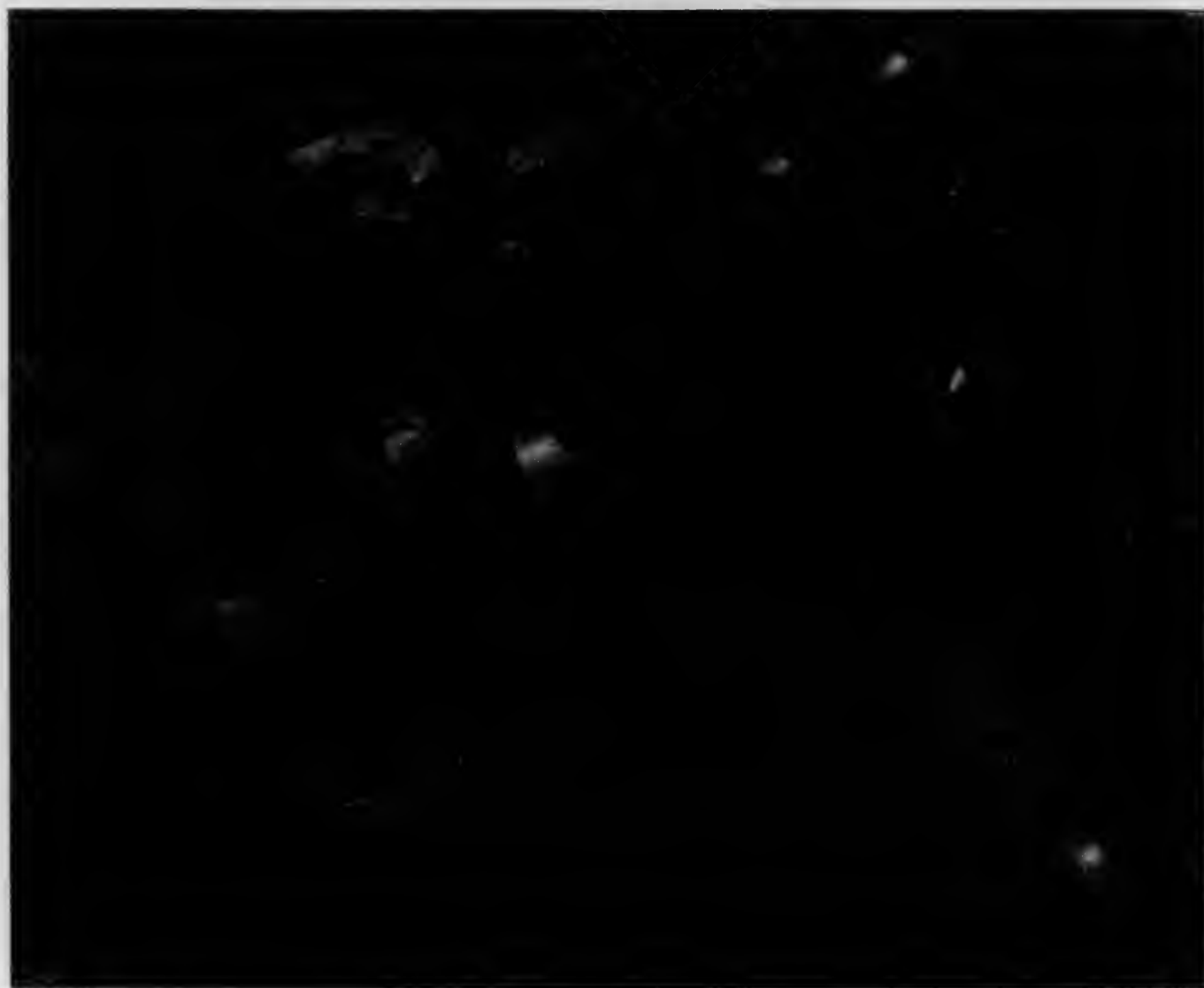


FIGURE 3.—Apples sprayed with lead arsenate and lime-sulphur. The sprayed trees were of the same variety and location as those shown in Fig. 2.

In the control of curculio on apple, however, we do not say that the times indicated above are necessarily the best. That is a problem for the entomologist. We are merely calling attention to one case of quite thorough control at the times indicated, primarily with lead arsenate and lime-sulphur, though certain other materials were at least equally effective.

TABLE V.

Effect of Sprays on Scab and Brown Rot of Peaches.

Plot	Treatment	No. of Fruits in sample	No. Fruits with Scab	Per cent. Scab	No. Fruits with Rot	Per cent. Rot
I.	Check,	549	470	85.6	262	47.7
III.	Self-boiled and Arsenate,	430	28	6.57	35	8.2
IV.	L-S and Arsenate,	424	31	7.3	92	21.7
V.	L-S and Arsenite,	487	79	16.2	55	11.33
VI.	L-S and Arsenate, applied with CO ₂ ,	453	42	9.27	51	11.26
VII.	Sulfocide and Arsenate,	245	36	14.7	30	12.24
VIII.	Sulfocide and Arsenite,	359	82	22.8	30	8.36
IX.	Pyrox (5-50),	377	20	5.3	80	21.2
X.	Bordeaux (½-6-50) and Arsenate,	515	38	7.37	37	7.2
XI.	Bordeaux (¼-6-50) and Arsenate,	459	48	10.48	43	9.4
XIII.	Check,	495	443	89.5	97	19.6

In Table V, in which direct fungicidal values are compared, first place plainly lies between plots III and X, which are practically equal in their per cent. of scab and rot. The advantage is with III, however, since the conditions near it were apparently more severe, as indicated by the nearest checks. The rot reduction on plot XIII was probably due to its being within two or three rows of the edge of the orchard, at which there was a sudden steep break or descent in the hill, thus affording better ventilation or air drainage. This did not affect the amount of scab, however, and it is doubtful whether the reduced-rot influence extended much beyond the adjoining plots. The high efficiency of the Bordeaux of plot X is certainly worthy of note, however, and of further trial.

It will be observed that the sulphur-arsenate combination in plot IV controlled scab very well, reducing it from an average of 87.5 per cent. on the checks to 7.3 per cent. but that it apparently failed rather badly in rot-control, reducing it only about one-half. In plot VI, however, the same materials applied with carbon-dioxid, which we have seen is an undesirable treatment, show very satisfactory control. This is quite surprising, especially in view of the increased fungicidal action obtained from this combination by Wallace, and it is another of the cases that we do not attempt to explain. We believe, though, that the showing of the figures in IV, against rot is worse than the actual facts, due to accidents of sampling in this plot as already noted in connection with Table IV. It is probable that about 15 per cent. of rot is more nearly correct. Even at that the advantage in Plots V and VI is probably connected with their better control of curculio and to the much greater amount of sunlight in VI as a result of loss in foliage. These conditions also doubtless partly account for the excellent showing against rot

in VIII, another undesirable treatment. It should be noted especially, however, that the precipitation of the sulphur in VI at least did no appreciable damage to its fungicidal value.

Influence of Sprays on Carrying Quality.

Any treatment that improves the carrying quality of such a short-lived fruit as peaches is of great importance. To determine the effect of our most promising sprays on this point, some fifteen half-bushels of fruit were taken from each of the plots indicated in Table VI. This fruit without further spraying, was placed in a car of peaches for shipment from Bellefonte to DuBois, Pa.

The test turned out to be a particularly severe one, inasmuch as the car was left un-iced and un-ventilated and, owing to various delays, it failed to reach its destination for fruit delivery until August 26, three days after the fruit was picked. The condition of the fruit when examined by Mr. Sill is shown in Table VI.

TABLE VI.

Effect of Different Sprays on Carrying Quality of Peaches.

Plot	Treatment	Hours between shipment and examination	No. of Fruits examined	Number rotted	Per cent. rotted
III.	Self-boiled lime-sulphur and lead arsenate,	52	166	33	19.87
IV	L-S and lead arsenate,	53	200	94	47.
V.	L-S and lime arsenite,	51	216	31	14.32
XI.	Dilute Bordeaux and lead arsenate,	49	181	62	34.25
XIII.	Check,	50	144	144	100.

The unfavorable conditions of shipment, with the accompanying rapid respiration of the peaches, developed a thoroughly stifling heat in the unventilated car, and furnished ideal conditions for rot. The result was that the unsprayed fruit showed 100 per cent. of rot as indicated in the table. Under the same conditions the rot on the sprayed fruit was reduced to 14.3 per cent. in one case, and to 19.8 per cent. in another. Such improvements in carrying quality alone certainly justify the practice of spraying.

The difference observed between plots IV and V is probably largely due again to the difference of curculio injury, coupled with the larger amount of rot present in the fruit when picked. This gave a greater chance for infection in passing over the mechanical sizer, which was used in grading the fruit. It will be noted further that throughout the experiment, excepting scab control, arsenite of lime¹⁰ in the second sulphur spray has apparently proved a little more efficient and a little more dangerous than lead arsenate. This

greater danger, and also the unfavorable results with the arsenite reported by Wallace at Cornell, make it inadvisable as yet to recommend its use. For the present, therefore, it appears to be safest to use high grade lead arsenate in connection with lime-sulphur sprays.

The self-boiled preparation again shows its marked superiority over the bordeaux. If we disregard its failure against curculio, which may have been accidental in this instance, it still remains the safest and most reliable peach spray that we know, and the only one that we can safely recommend on a large scale for this fruit. The excellent showing of the clear solution in certain instances, however, would indicate that with a little more knowledge of injury-control it may yet supercede the self-boiled, at least in the third application. This is primarily because of its apparently equal efficiency, even at the high dilutions required, together with its greater economy and convenience and its lessened staining of the fruit.

Prof. J. W. Yoder, accompanied on the piano by Mr. Berger, sang several selections during the evening which were very acceptable.

Adjournment.

¹⁰ It should be remembered that this arsenite of lime was made according to the formula which we presented in Buls. 92 and 99. It still doubtless has its faults, but it apparently is less dangerous than the material reported harmful by Scott, which was made by another method.

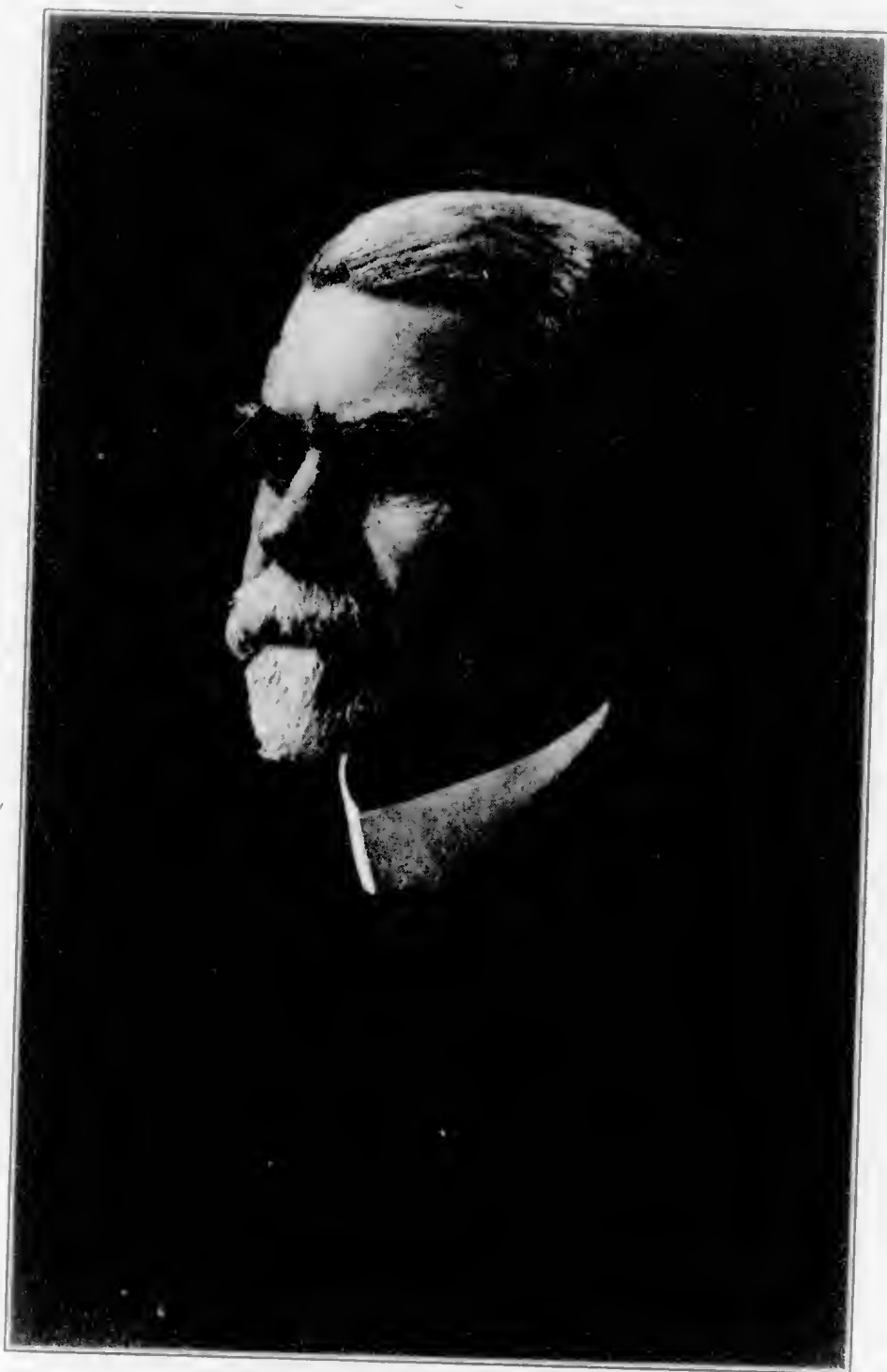
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GABRIEL HIESTER,
President 1905 to 1912.

END OF YEAR